EXOR
Asset Manager Admin Guide

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EXOR Asset Manager Admin Guide

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1 Introduction

This Guide is designed to aid in the setting up and maintenance of asset meta-data. Careful consideration should be given to the contents of this guide when networks and asset/Asset structures are being designed. Asset Manager provides a very powerful and flexible asset/Asset modelling package and therefore it is important that the user has a good understanding of the options available.

This Guide deals with the concepts of both asset placements, which are used to locate assets on the networks, as well as covering the actual physical asset components themselves.

This Guide will be useful to System Administrators and Experienced Users with responsibility for Asset Maintenance.

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1.1 Product Options

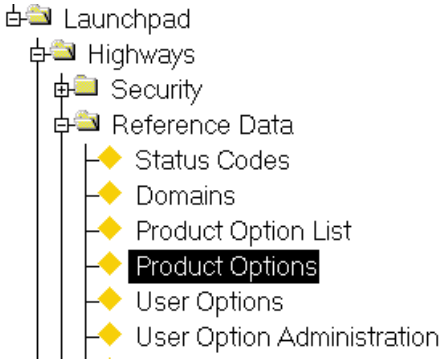

Figure 1 - Product Options Menu

Product Options allow 'switches' or default values to be set, which defines how certain functionality operates within the Exor suite of Products. The following Asset Manager related Product Options should be set to suit your Organisational requirements. Product Options are set using HIG9130 – Product Options.

Table 1

Option Id	*Option Name*	*Sample Value*	*Remarks*
MRGPOE	Split Merge Results at POE	Y	A value of "Y" means that merge query results will be split at any discontinuities (POEs) on the route"
MRGROUTE	Split Merge Results by route	Y	A value of "Y" means that merge query results will be split at any change of route"
PBIPOE	Split PBI Results at POE	Y	A value of "Y" means that PBI query results will be split at any discontinuities (POEs) on the route"
MRGAUTYPE	AU Type for Merge Security	TNC	This is the AU Type which is used for Merge Results Security
UTLFILEDIR	UTL File Directory	D:\NM3	Directory where PL/SQL will read/write flat files
MAPCAPTURE	Is MapCapture Used	N	Set this option to "Y" if the system uses MapCapture. This will enable the Asset views required for MapCapture to be generated whenever the normal Asset views are created
MULTINVRTE	Multiple Asset on Network	Y	Used for placing Asset using a Network Extent. If set to Y allow multiple routes, N - Single Route
SHOWINVPK	Show Primary Key in Inv Form	Y	If set to Y the primary key will always be visible on the Asset form, if N then the PK will only be visible if it is a flexible attribute or when the form is in query mode. If the User Option of the same in present it will take precedence over the Product Option for the User
INVRTETAB	Default Route Tab in Inv Form	Y	If set to Y the default tab in the Asset form will be Route.
DEFAORDPI	Default AOR Dist Point Interval	10	This is the default Distance Point interval using in Assets on Route - NM0560. The units of measurement are set during the selection of the Display Items
DEFITEMTYP	Default Reference Item Type	REFF	This is the Default Asset Item Type used on the Assets on a Route Module. If the User Option of the same in present it will take precedence over the Product Option for the User

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Option Id	*Option Name*	*Sample Value*	*Remarks*
AOREXTDINV	AoR do not truncate Asset	Y	If this is 'Y', then when running Assets on a Route on a part of a linear route any continuous Asset which was truncated by virtue of the beginning or end of the specified extent will be returned with the location of that item extended beyond the selected extent
AORSTRMAP	AoR strip map by default	N	If Set to Y the Assets on Route strip Map will be displayed by default on entry into the AOR Results window. If the User Option of the same in present it will take precedence over the Product Option for the User
ATTRLSTSEP	Inv Attribute List Separator	,	This is the character used to separate Inv attribute values when viewed in a concatenated String.

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2 Asset Reference Data

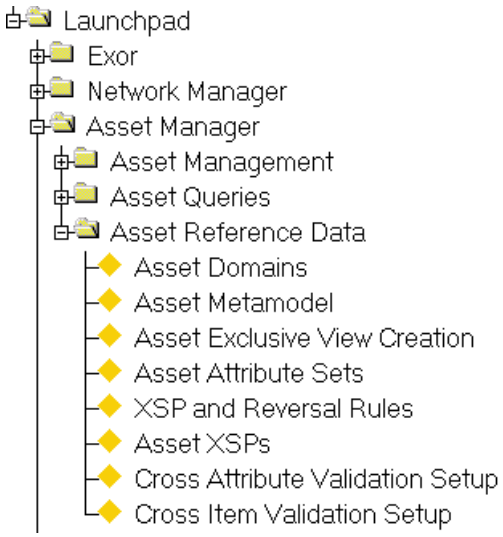

Figure 2 - Asset Reference Menu

This chapter describes the forms and processes that are used for defining and managing the metadata required for use with Asset management. The forms covered in this chapter are the following:

- Asset Domains – NM0301
- Asset Metamodel – NM0410
- Asset Exclusive View Creation - NM0411
- Asset Attribute Sets - NM0415
- XSP and Reversal Rules – NM0305
- Asset XSP's – NM0306
- Cross Attribute Validation Setup – NM0550

The module descriptions provide you with detailed information about reference data in Network Manager by Exor, including:

- an overall description of the form
- a detailed explanation of each field, including available features (such as List of Values, default values and other characteristics)
- helpful information for using the form

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2.1 Reference Data Workflow

Figure 3 displays the workflow when defining the reference data for an Asset Type.

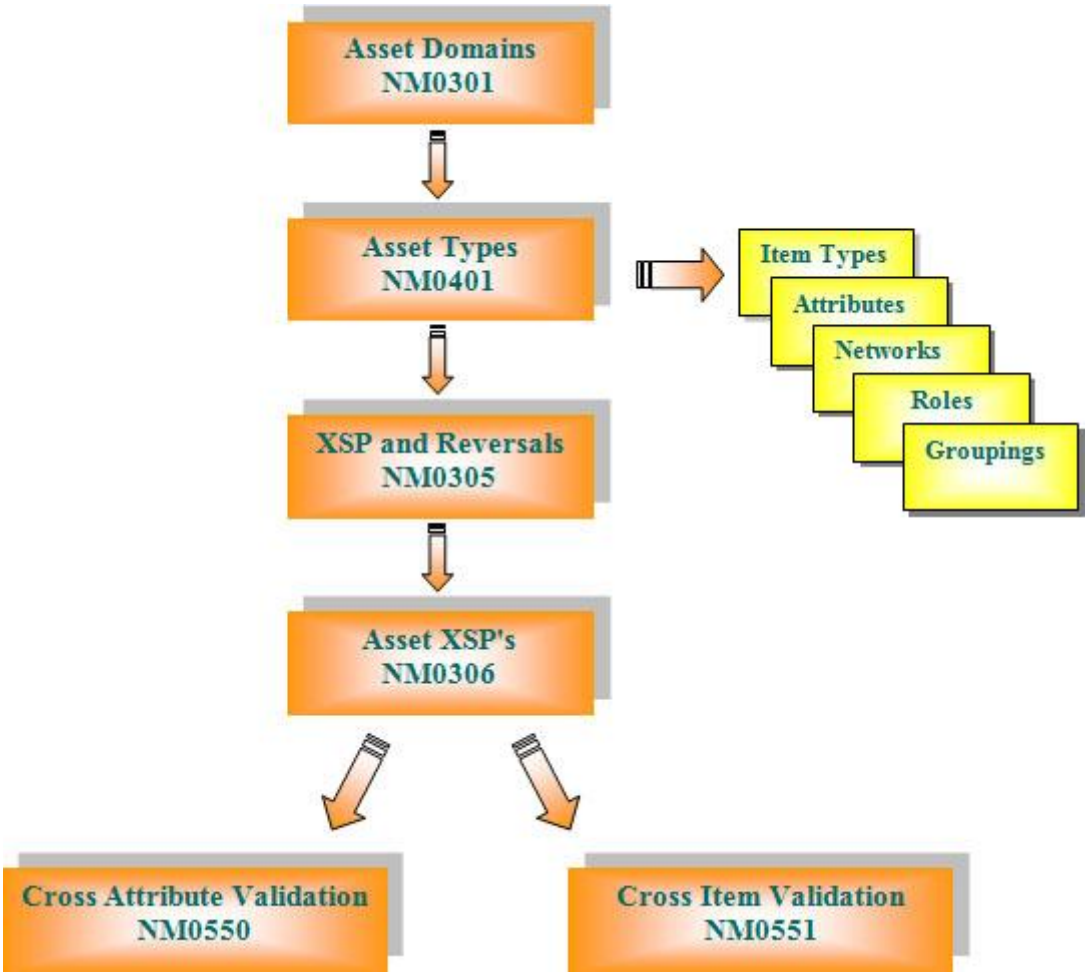

Figure 3 – Reference Data Workflow

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2.2 Asset Domains – NM0301

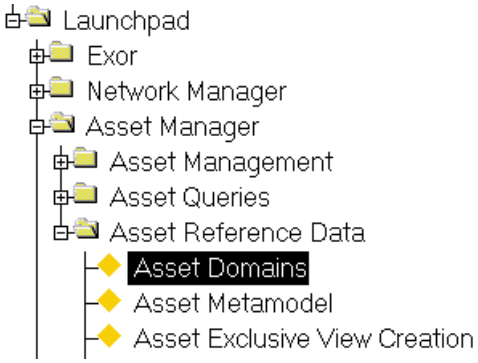

Figure 4 - Asset Domains Menu Option

This module is used to maintain the Domains and associated List of Values used by those Asset Item Attributes whose value is selected from a list as a means of data entry validation. Attributes of any data type, *i.e.*, VARCHAR2, NUMBER or DATE may be validated against a Domain.

Domains may be 'shared' by many different Attributes and Asset Item Types, which have similar properties. For example, the Domain PAVE_MATERIAL (selected in the screen shot above) is used by 3 different Asset Item Types, namely PAOR (Pavement Original), PASH (Pavement Shoulder) and PAWI (Pavement Widening). Each of these Asset Item Types has 2 attributes, which uses the PAVE_MATERIAL Domain.

Consider the Asset Item Type PAOR (Pavement Original). This item type includes attributes that define the Base and Sub-base material used in the road construction. By including all the possible materials that may be used for this purpose within the same Domain, it is then possible for each of the Attributes to use that Domain from which to select the required value.

The Asset Item Types and Attribute Column Names that use a Domain are displayed in the 'Types Using Domain' area of the screen.

The Domains defined using this form may be selected in the 'Domain' field on the 'Attributes' window of form NM0410 – Asset Types (Page 15).

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2.2.1 Asset Domains

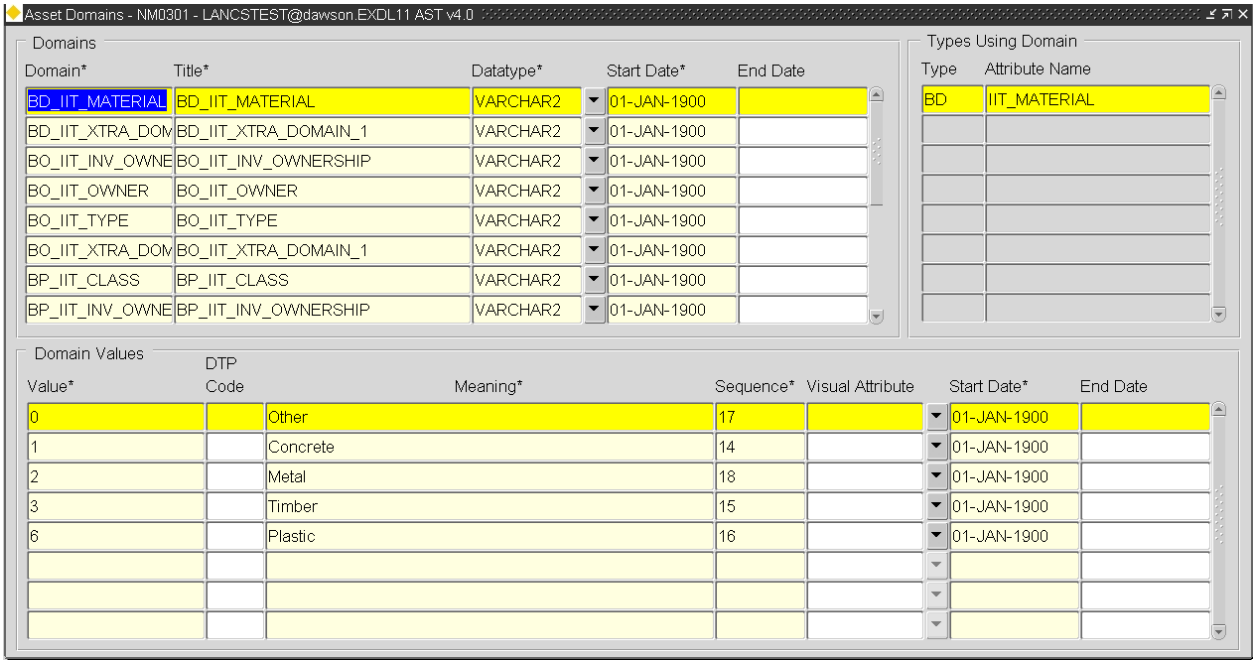
Asset Domains - NM0301 - LANCSTEST@dawson.EXDL11 AST v4.0
Domains
Domain* Title* Datatype* Start Date* End Date
BD_IIT_MATERIAL BD_IIT_MATERIAL VARCHAR2 01-JAN-1900
BD_IIT_XTRA_DOM BD_IIT_XTRA_DOMAIN_1 VARCHAR2 01-JAN-1900
BO_IIT_INV_OWNE BO_IIT_INV_OWNERSHIP VARCHAR2 01-JAN-1900
BO_IIT_OWNER BO_IIT_OWNER VARCHAR2 01-JAN-1900
BO_IIT_TYPE BO_IIT_TYPE VARCHAR2 01-JAN-1900
BO_IIT_XTRA_DOM BO_IIT_XTRA_DOMAIN_1 VARCHAR2 01-JAN-1900
BP_IIT_CLASS BP_IIT_CLASS VARCHAR2 01-JAN-1900
BP_IIT_INV_OWNE BP_IIT_INV_OWNERSHIP VARCHAR2 01-JAN-1900
Types Using Domain
Type Attribute Name
BD IIT_MATERIAL
Domain Values
Value* DTP Code Meaning* Sequence* Visual Attribute Start Date* End Date
0 Other 17 01-JAN-1900
1 Concrete 14 01-JAN-1900
2 Metal 18 01-JAN-1900
3 Timber 15 01-JAN-1900
6 Plastic 16 01-JAN-1900

Figure 5 - Asset Domains

This area of the window is used to define the Domain name and time period during which the Domain, and hence the associated list of values, is valid.

When you enter this form the cursor sits in the 'Domain' field waiting for a new Domain to be added or existing Domains to be retrieved. To query back an existing Domain press the [Enter Query] button on the menu toolbar (or press F7), enter some selection criteria, then press the [Execute Query] button (or press F8).

Domains ***(Required)***

Enter a Unique Name for the Domain. A maximum of 30 characters is allowed.

Title ***(Required)***

Enter a title for the Domain. This title will be displayed on the LOV window when called. A maximum of 80 characters is allowed.

Data Type ***(Required)*** ***List***

Enter the Data Type of the Attribute which will use this Domain. For example, if the Domain Values contain a list of Dates which are to be used to validate the entry of a Date Attribute, select DATE as the Data Type. When the List of Values for available Domains is called in the Asset Metamodel - NM0410 module, the list will only display Domains whose Data Type matches the Data Type specified for the Attribute.

Start Date ***(Required)***

Enter the date from which the Domain is effective.

End Date ***(Optional)***

Enter the date from which the Domain ceases to be effective. A Domain cannot be End Dated unless all of the associated Values have also been End Dated.

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2.2.2 Domain Values

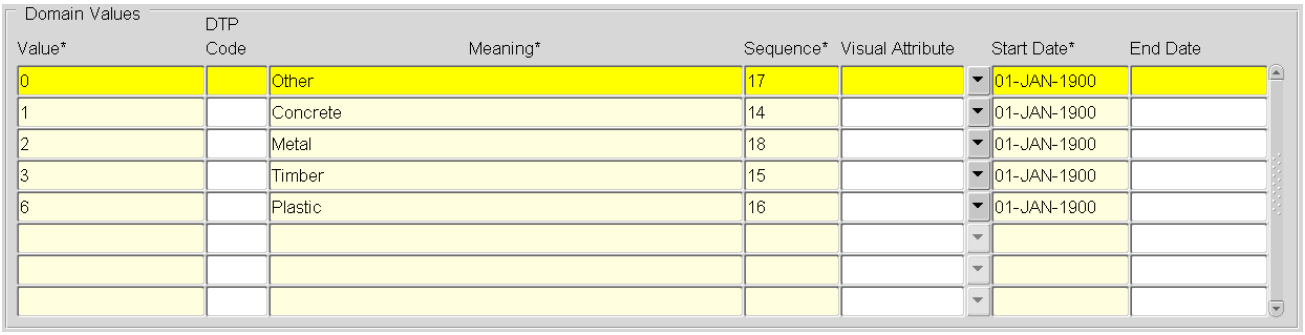

Figure 6 - Domain Values

The Domains Values panel is used to define the allowable values for a Domain. These are the only allowable values for the Asset Attribute using the Domain and will appear in a List of Values for the Attribute.

When a Domain is selected the associated Domain Values will be displayed. To add a new Domain Value press the [Create Record] button on the menu toolbar or click in the next available 'Value' field, and enter the required information.

Value ***(Required)***

Enter a code for the items in the list. A maximum of 30 characters is allowed.

DTP Code ***(Optional)***

Enter the DTP (Department of Transport) Code for the list item if required. A maximum of 4 characters is allowed.

Meaning ***(Required)***

Enter a meaning for the value that you have just entered in the Value field. A maximum number of 80 characters is allowed.

Sequence ***(Required)***

Enter a sequence number that will order the display of Values for this Domain within a List of Values.

Visible Attributes ***(Optional)*** ***List***

Visible Attributes are used within some Exor applications such as Schemes Manager when generating Graphic images. The Visible Attributes consist of details of the Background colour, Foreground colour and Fill pattern used when generating the image.

Start Date ***(Required)***

Enter the date from which the Domain Value is effective.

End Date ***(Optional)***

Enter the date from which the Domain Value ceases to be effective.

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2.2.3 **Types Using Domain**

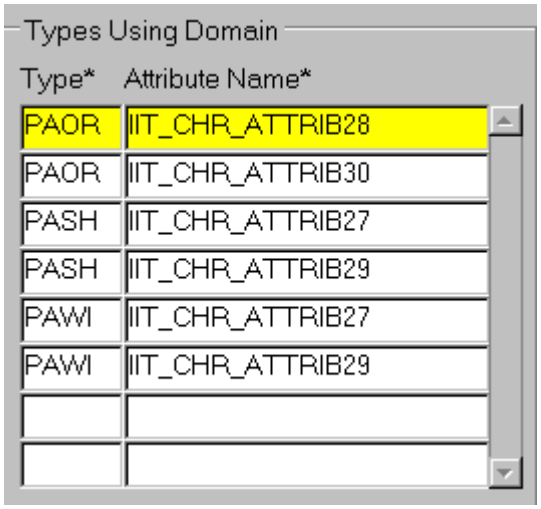

Figure 7 - Types using Domain

This area of the window is for display only and shows the Asset Item Types and Attribute Column Names using the Domain.

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2.3 Asset Metamodel – NM0410

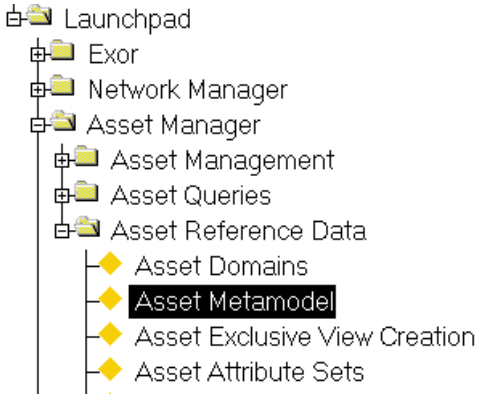

Figure 8 - Asset Metamodel Menu Option

The Asset Metamodel form is used to manage the different types of Asset which are held within the Exor database. As well as Asset types being defined using this form, any other type of object or feature may also be modelled. For example, the Roughness or Skid Resistance of section of Road, Road Construction Layer information or condition surveys could all be stored as Asset Items within the Exor database.

The Asset Metamodel form has several main functions including:

- Defining the 'Behaviour' of an Asset Type *e.g.*, whether the Asset type is a Point or Continuous feature or whether Asset of this type is Replaceable when network elements are end-dated.
- Defining the characteristic attributes of the Asset Type
- Specifying to which Network Types an Asset Item of this Type may belong.
- Specifying the Role a User must be granted to access Asset Items of this type and the mode of access permitted *i.e.*, Normal or Read-Only.
- Defining the Asset Groupings and relationships for Hierarchical Asset Types.

The installation procedure will load your Exor database with a set of Asset Types that are in common use. If however, you require additional Asset Types on your network, you will have to set up the Asset Item Types using this form before you can proceed to load your Asset data.

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2.3.1 Types

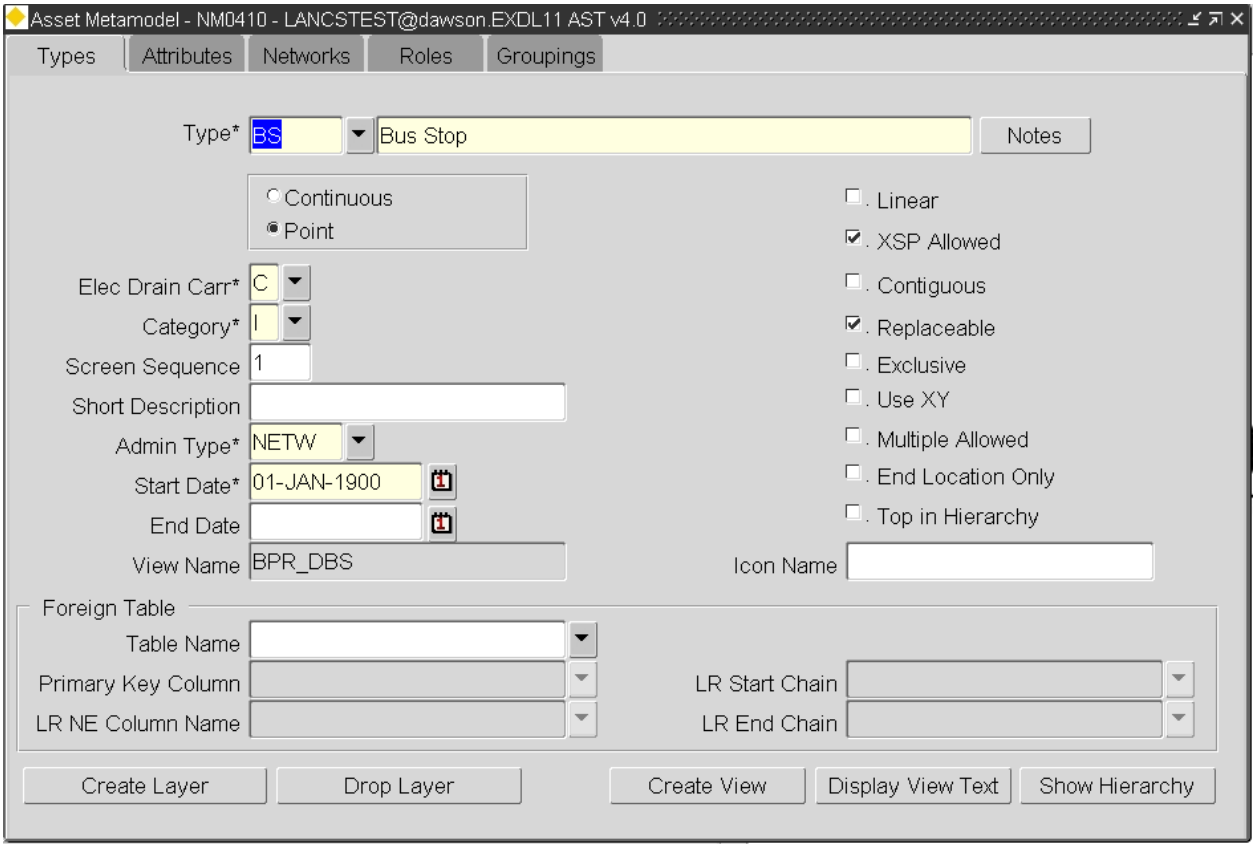

Figure 9 - Asset Metamodel

This window is used to manage Asset Types and define their 'behaviour' *e.g.*, whether an Asset Item of this type is 'Replaceable' or is associated with a valid XSP (cross sectional position).

When you enter this form the cursor sits in the 'Type' field waiting for a new Asset Type to be added or existing Asset Types to be retrieved. To query back an existing Asset Type press the [Enter Query] button on the menu toolbar (or press F7), enter some selection criteria, then press the [Execute Query] button (or press F8).

Type ***(Required)***

Enter a Unique code for the Asset Type. A maximum of 4 characters is allowed.

(Type Description) ***(Required)***

Enter a description of the Asset Type in the adjacent field. A maximum of 80 characters is allowed.

Continuous/Point ***(Required, Default)***

If the Asset Type is one that occurs at a single point *i.e.*, an Asset Item of this type has the same Start and End Chainage, for example a Sign, select 'P'. If the Asset Type is a Line feature, *i.e.*, an Asset Item of this type has different Start and End points, for example a Verge or Shoulder, enter 'C'.

The default value is 'P'.

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Elec Drain Carr ***(Required, Default)*** ***(List)***

Select either 'E' if the Asset Type relates to an Electrical feature, 'D' for a Drainage feature or 'C' for a Carriageway feature. The List of Values is maintained using Domains - HIG9120 and updating Domain ELEC_DRAIN_CARR.

Category ***(Required, Default)*** ***(List)***

Select the general category to which the Asset item type belongs, *i.e.*, 'C' for condition data, 'I' for Asset or Asset Data, 'F' for foreign Table etc.

Note:

- Only one Asset Type may have a Category of 'R'. This is used within the Structural Projects Modules to indicate Road Construction Data and may only be selected if Structural Projects is licenced in HIG1890 – Products
- Asset Types used for Associated Data Types (Network Manager System Admin Guide) must be of Category 'G'. Such Asset Types must be defined as 'Continuous'.
- Asset Types used to model Condition Data, *e.g.*, SKID must have a category of 'C'. Schemes Manager will use this Category when determining what Asset Data should be end dated when a Road Construction Scheme is completed.

Screen Sequence ***(Optional)***

Enter the Sequence Number in which you wish this Asset Type to be displayed in relation to other types within the relevant reports.

Short Description ***(Optional)***

If required enter an abbreviated description for this Asset Type *e.g.*, for Course Visual Inspection data enter CVI. This is used in some UKPMS reports.

A maximum of 30m characters is allowed.

Note: This field is only used in conjunction with UKPMS.

Viewname ***(Display Only)***

The system will generate a View name for the Asset Type. Views can be used to 'filter' only the required information from very large table thus enhancing system performance. The Asset Views are used in some reporting facilities and could also be used when creating a GIS theme to display Asset Items of this type (see note below for View used for GIS Themes). The use of Database Views is totally transparent to the User.

The naming convention of the View name is as follows:

V_NM_<attribute code>

For example: **V_NM_RALI**, where 'RALI' is the Asset Type code for a Rail Line feature.

To view the SQL*Plus statement used to create the view press the [Display View Text] button.

Note:

Note a second view will also be created if the Inv Type has an associated Network, appending '_NW' to the viewname, *e.g.*, V_NM_RALI_NW. This view can be used when creating a GIS Theme for the Asset Type.

The Viewname will NOT be displayed and the [Create View] and [Display View Text] buttons will be unavailable if a value is entered in the 'Table Name' field in the 'Foreign Table' panel.

(See page 46 for more information on Asset Views).

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Admin Type ***(Required)*** ***(List)***

Enter the Admin Type associated with this Asset Type. Only Admin Units of this type may be assigned to Asset Items of this type. To access an Item of this type a User must have the appropriate Admin Unit assigned to them.

Start Date ***(Required)***

Enter the date from which the Asset Type is valid. No Asset Items of this type may be loaded or manually entered prior to this date.

End Date ***(Optional)***

Enter the date from which the Asset Type ceases to be valid. No Asset Items of this type may be loaded, manually entered or amended subsequent to this date.

Icon Name ***(Optional)***

Enter the filename of the Icon to be used to represent the Asset Type. This icon will be used to diagrammatically depict Asset Items of this type on windows such as the 'Hierarchy' window in the Asset Items – NM0510 form or the 'Show Hierarchy' window. A maximum of 30 characters is allowed.

Double clicking this field or pressing the 'file open' icon will open a Windows 'Find File' dialog box (Figure 10) This enables a User to 'browse' their system to locate the appropriate icon file.

Note: You should include the DOS extension if the filename includes one.

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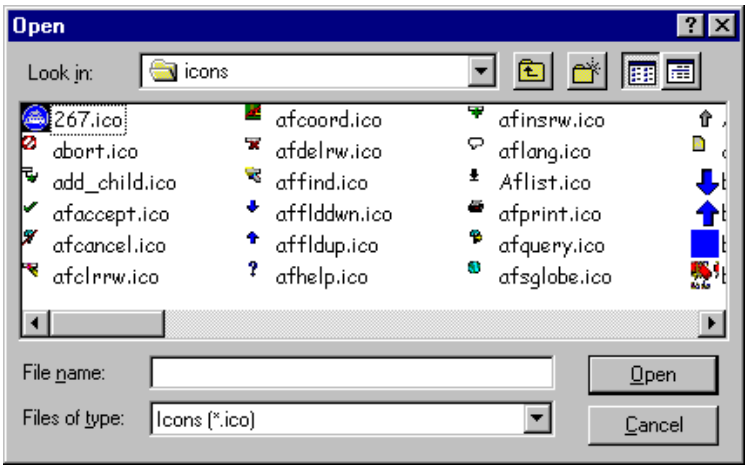

Figure 10 - Find File dialog box

2.3.2 **Notes Button**

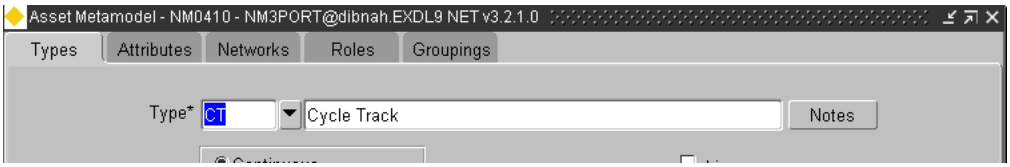

Figure 11 – Notes Button

Miscellaneous notes or any free hand text relating to the Asset Type may be entered using the notepad which is called by pressing the [Notes] button. This will call a notepad window which can store up to a maximum of 4000 characters of text. An example of the Notepad is shown in Figure 12.

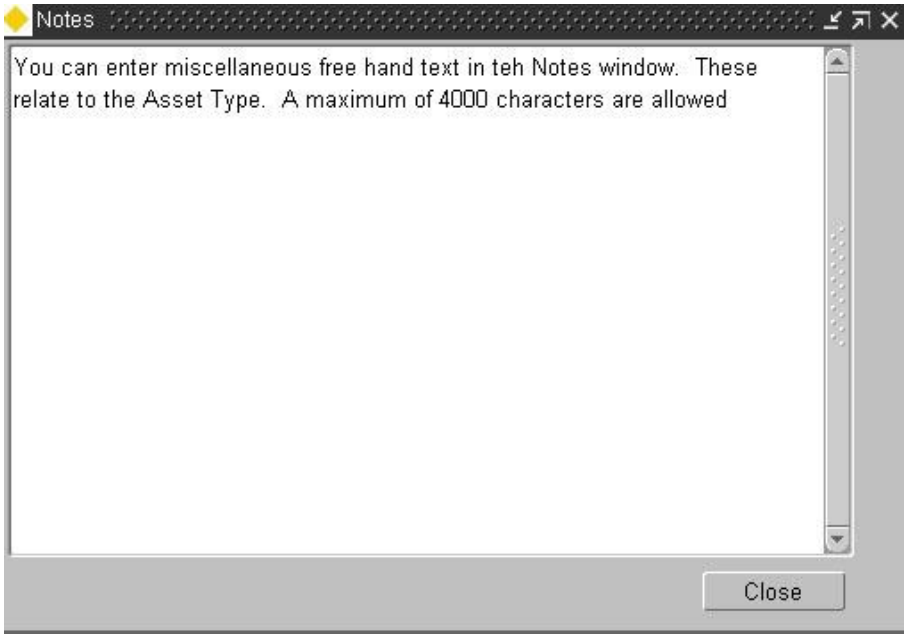
Notes
You can enter miscellaneous free hand text in teh Notes window. These relate to the Asset Type. A maximum of 4000 characters are allowed
Close

Figure 12 - Notepad

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2.3.3 Foreign Table Panel

As well as managing Asset Types for Asset Item data held within the main Asset table, this form can also be used to manage Asset Types for Asset Item data held in external tables or views or other tables or database views within the Exor database. For example, Skid Resistance values or Roadway Deflection figures collected from road machine surveys may be held externally. These could be integrated with Exor to take advantage of the full range of Asset Related functionality available, for example PBI or Asset Merge Queries. More information on Foreign Tables may be found on page 58.

Note: Data from other products from within the Exor product set may be used in reports and queries, *e.g.*, Asset Merge Queries, by creating an Asset Type for the data and utilising the Foreign Table functionality. For example, to use Accident or Structures data a database view could be created of the required information and an 'Accident' or 'Structures' Asset Type defined in the same manner as for an Asset Item.

Table Name (Mandatory if using Foreign Tables) (List)

The name of the table or database view within which the 'external' Data is stored should be entered here. A maximum of 30 characters is allowed.

Primary Key Column (Mandatory if using Foreign Tables) (List)

If an external Table or database view is being used to hold the Asset Item data for this Asset Type the Column Name that holds the Asset Item Primary Key should be entered here.

LR Start Chain (List)

If an external Table or database view is being used to hold the Asset Item data for this Asset Type and the Asset are located on a Network, the Column Name that holds the Start Position of the Asset Item should be entered here. A maximum of 30 characters is allowed. The data type of this column must be numeric.

LR NE Column Name (List)

If an external Table or database view is being used to hold the Asset Item data for this Asset Type and the Asset are located on a Network, the Column Name that holds the Foreign Key to the Network Element, within the Exor database should be entered here. A maximum of 30 characters is allowed. The data type of this column must be numeric.

LR End Chain (List)

If an external Table or database view is being used to hold the Asset Item data for this Asset Type and the Asset are located on a Network, the Column Name that holds the End Position of the Asset Item should be entered here. A maximum of 30 characters is allowed. The data type of this column must be numeric.

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2.3.4 Creating a Foreign Table Asset Type for Datum Network Types

Asset Types may be defined to represent Datum Network Elements using the Foreign Table functionality available via module NM0410 – Asset Metamodel.

This allows flexible attributes and other 'fixed' information relating to Datum Network Elements to be used when defining queries such as Parameter Based Inquiries (NM7040) and Merge Queries (NM7050).

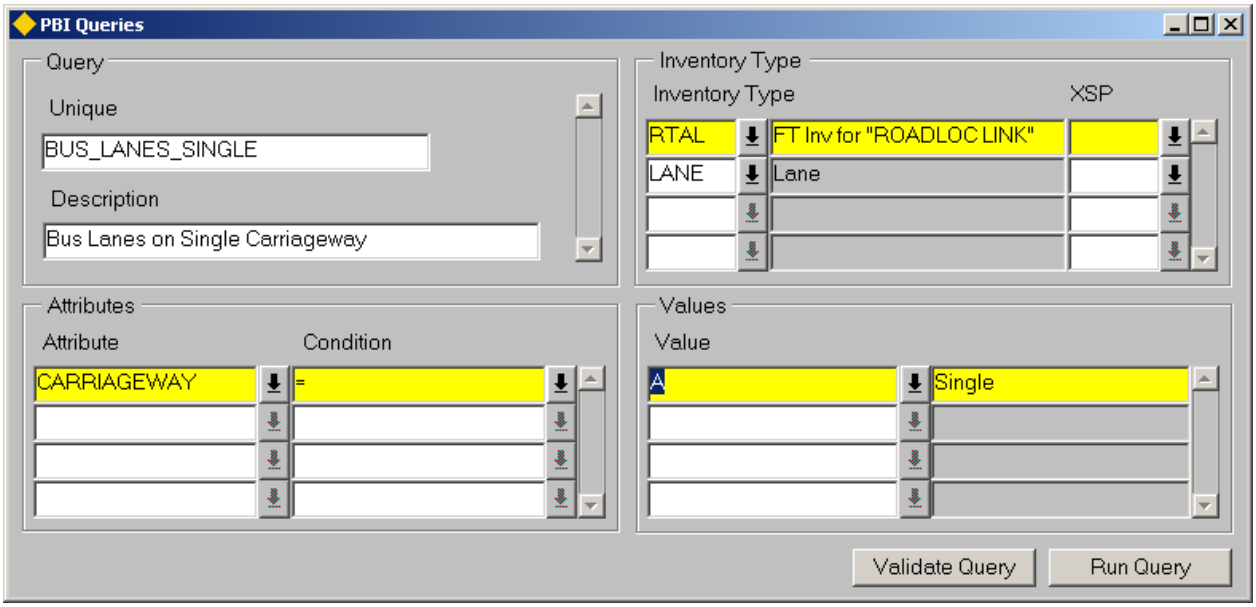

Figure 13 – PBI Queries

Figure 13 shows an example of a PBI query definition where the Foreign Table Asset type for a Datum Network Type is being used to restrict the query to only those parts of the selected Region of Interest where the Carriageway Type is 'A' – single (CARRIAGEWAY is an attribute of the Datum Network Type).

Foreign Table Asset definitions for any Datum Network Types defined in NM0002 – Network Types may be created by pressing the [Create Foreign Table Inv] button on in Network Types - NM0002 (Network Manager Admin Guide).

This will create a 'Continuous' Asset Type for the selected Datum Network Type of category 'X' - Generated Exclusive Asset Type. The Asset Type Name will be defaulted to the Network Type but this may be amended using the 'Asset Type' field in the 'Create Foreign Table Inv' (Figure 14) dialogue. The Asset Type description will be in the format of: FT Inv for "Datum Network Type Description" *e.g.*, FT Inv for "Classified Roads". This Asset Type description may be amended if required.

A foreign table join will be created to a database view. The naming convention of the View name is as follows:

V_NM_<Item code>

For example: **V_NM_CLAS**, where 'CLAS' is the Asset Type code for the Datum Network Asset Type.

The remainder of the Foreign Table join definition is as follows:

Primary Key Column	NE_FT_PK_COL
LR NE Column Name	NE_ID
LR Start Chain	NE_BEGIN_MP
LR End Chain	NE_LENGTH

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An Asset Attribute will be created for each of the flexible network attributes defined in the 'Type Columns' field for the Datum Network Type in NM0002 – Network Types, as well as Attributes for 'fixed' attributes such as Length, Admin Unit and Description. Any unwanted Asset Attributes may be 'End Dated' by selecting the required Attribute and pressing the [Delete] button on the menu toolbar.

Table 2 displays the Asset Attributes that will be created:

Table 2

Attribute Name	*Screen Text*	*View Column Name*
NE_ID	Id	NE_ID
NE_FT_PK_COL	Ft Pk Col	NE_FT_PK_COL
NE_UNIQUE	Unique	NE_UNIQUE
NE_BEGIN_MP	Begin Mp	NE_BEGIN_MP
NE_LENGTH	Length	NE_LENGTH
START_NODE_ID	Start Node Id	START_NODE_ID
END_NODE_ID	End Node Id	END_NODE_ID
NE_DESCR	Descr	NE_DESCR
NE_START_DATE	Start Date	NE_START_DATE
NE_ADMIN_UNIT	Admin Unit	NE_ADMIN_UNIT
ADMIN_UNIT_CODE	Admin Unit Code	ADMIN_UNIT_CODE
…Attribute 1…	…Attribute 1…	Attribute 1…
…Attribute 2…	…Attribute 2…	Attribute 2…
…etc…		

If any of the Network Attributes defined in the 'Type Columns' field for the Datum Network Type in NM0002 – Network Types are validated against a System Domain (maintained using HIG9120 – Domains) an Asset Domain will be created and the Domain associated with the appropriate Attribute allowing a List of Allowable value to be displayed for the Attribute when defining a query such as PBI or Merge.

The Asset Domain created will derive its name from the name of the System Domain. If an Asset Domain of this name already exists the Asset Domain Title will checked against the System Domain Title. If the Domain Titles are also the same a new Asset Domain will not be created and the existing Asset Domain will be associated with the Asset Attribute.

If however, the Asset Domain and System Domain names are the same but the Asset and System Domain Titles are different a new Asset Domain will be created using the following naming convention:

<Datum Network Type Name_HIG_DOMAIN Name>

For example: **CLAS_CARRIAGEWAY_TYPE**, where 'CLAS' is the Datum Network Type and 'CARRIAGEWAY_TYPE' is the System Domain Name.

Note: If additional lookup values are added to the System Domain these must also be added to the corresponding Asset Domain.

An appropriate User Role must be defined in Order for a Exor User to have access to the Asset Type.

When the button is pressed a dialogue will be displayed as in Figure 14.

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Figure 14 – Dialogue window

Asset Type ***(Required)*** ***(List)***

The Asset Type Code will default to the Network Type Code. This may be changed if required. A maximum of 4 characters is allowed.

Delete Inv Type if exists ***(Checkbox)***

If this flag is selected and an Asset Item type of the Code entered in the 'Asset Type' field already exists and also of Category 'X' - Generated Exclusive Asset Type, the existing Asset Type will be deleted.

To create the Foreign Table Asset Type press the [Proceed] button or [Cancel] to close the dialogue. If the [Proceed] button is pressed a message will be displayed informing the User that the Foreign Table Asset Type will be created. To carry out the operation press the [OK] button.

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2.3.5 LRM (Route) Based Foreign Table Data

Asset data held in 'external' tables whose location is referenced by the LRM/Route on which it resides and its Start and End Offsets may be integrated with Exor to utilise query functionality such as Parameter Based Inquiries (PBI) or Merge Queries or to display the Assets within Spatial Data Manager, by creating a Foreign Table Asset Type using the view definition shown in Figure 17. This database view 'translates' the Route and Offset data into the related Datum Element and chainage. For example, Figure 15 shows a 'Foreign Asset' that spans 3 Datum Elements. Table 3 shows how the data may be held in the 'Foreign Table'.

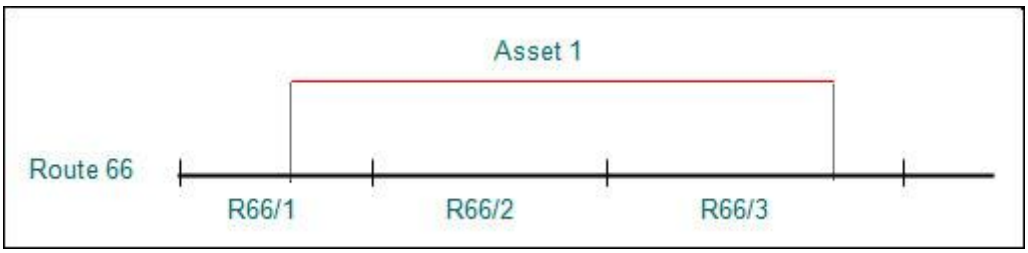

Figure 15 – Foreign Table Asset Spanning 3 Elements

Table 3

Asset ID	*Route*	*Start*	*End*
1	R66	10	25

The Database view will translate this Route based location into the appropriate Datum Locations with a separate row fro each of the Datums on which the Asset is located as shown depicted in Table 4.

Table 4

Asset ID	*Datum*	*Datum Start*	*Datum End*
1	R66/1	10	12
1	R66/2	0	15
1	R66/3	0	8

Figure 16 shows the 'Foreign Table' definition which the database view in Figure 17 utilises.

ROUTE	VARCHAR2 (10)	Y
START_POINT	NUMBER (10,2)	Y
END_POINT	NUMBER (10,2)	Y
ASSET_REF	NUMBER	Y
DATE_LAST_INSPECTED	DATE	Y
TYPE	VARCHAR2 (10)	Y
DIAMETER	NUMBER (6,2)	Y
COST_PER_METRE	NUMBER (6,2)	Y

Figure 16 – Foreign Table Definition

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Figure 17 shows the database view definition used as the 'Foreign Table' when creating the Foreign Table Asset Type.

```
CREATE OR REPLACE VIEW V_PIPE_FT ( ASSET_REF,
ROUTE, START_POINT, END_POINT, DATE_LAST_INSPECTED,
TYPE, DIAMETER, COST_PER_METER, NE_UNIQUE,
NE_ID_OF, NM_SLK, NM_BEGIN_MP, NM_END_MP,
NE_ID_IN, FT_PK_COL ) AS SELECT /*+index NM_PK */
    P.ASSET_REF
   ,P.ROUTE
   ,P.START_POINT
   ,P.END_POINT
   ,P.DATE_LAST_INSPECTED
   ,P.TYPE
   ,P.DIAMETER
        ,COST_PER_METRE
   ,ne_unique
   ,ne_id ne_id_of
   ,nm_slk
   ,DECODE(SIGN( P.START_POINT - nm_slk ) * SIGN( P.START_POINT - nm_slk -
ne_length/1000)
        ,-1,(P.START_POINT - nm_slk) * 1000
        ,0, 0
        ,nm_begin_mp
        ) nm_begin_mp
   ,DECODE(SIGN( P.END_POINT - nm_slk ) * SIGN( P.END_POINT - nm_slk -
ne_length/1000)
        ,-1, ( P.END_POINT - nm_slk ) * 1000
        ,0, ne_length
        ,ne_length
        ) nm_end_mp
   ,P.NE_ID_IN,ROWNUM FT_PK_COL
FROM  nm_elements
   ,(SELECT P.*
        ,NM3NET.GET_NE_ID(ROUTE) NE_ID_IN
     FROM  PIPE_FT P
    ) P
   ,nm_members
WHERE P.ne_id_in   = nm_ne_id_in
AND  nm_ne_id_of   = ne_id
AND  P.END_POINT  >  nm_slk
AND  P.START_POINT <= nm_slk + ne_length/1000
```

Figure 17 – Database View Definition

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The resulting database view is show in Figure 18.

ASSET_REF	NUMBER	Y
ROUTE	VARCHAR2 (10)	Y
START_POINT	NUMBER (10,2)	Y
END_POINT	NUMBER (10,2)	Y
DATE_LAST_INSPECTED	DATE	Y
TYPE	VARCHAR2 (10)	Y
DIAMETER	NUMBER (6,2)	Y
COST_PER_METER	NUMBER (6,2)	Y
NE_UNIQUE	VARCHAR2 (30)	N
NE_ID_OF	NUMBER (9)	N
NM_SLK	NUMBER	Y
NM_BEGIN_MP	NUMBER	Y
NM_END_MP	NUMBER	Y
NE_ID_IN	NUMBER	Y
FT_PK_COL	NUMBER	Y

Figure 18 – Resulting Database View

The following additional Columns have been added in the view:

NE_UNIQUE	The Unique of the Datum
NE_ID_OF	The internal unique of the Datum
NM_SLK	The Offset/SLK of the Datum relative to the Route
NM_BEGIN_MP	The Start Point of the Asset relative to the Datum Element
NM_END_MP	The End Point of the Asset relative to the Datum Element
NE_ID_IN	The internal unique or the Route
FT_PK_COL	The Primary Key of the record

Figure 19 shows a Foreign Asset Type.

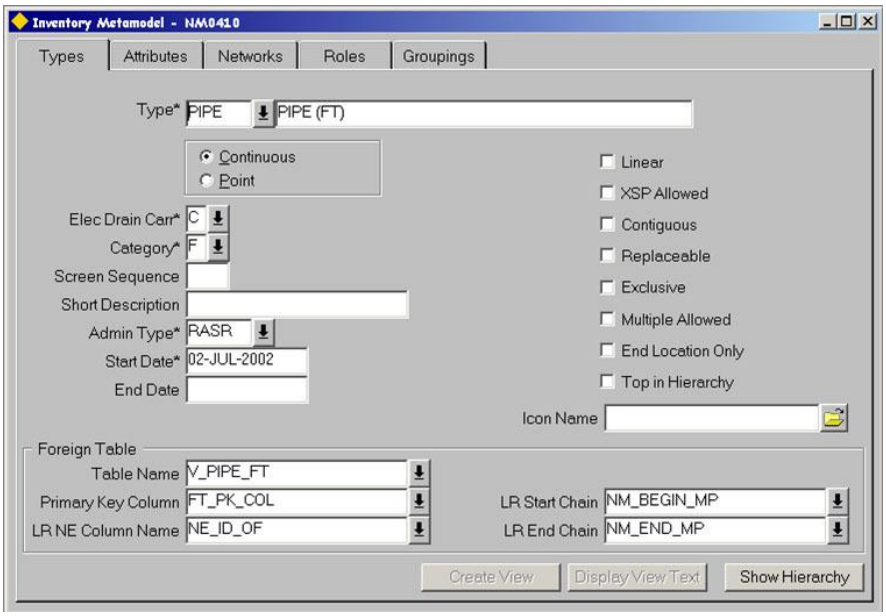

Figure 19

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2.3.6 Checkboxes

Linear

This option is no longer required for Linear assets, it remains for backward compatibility.

XSP Allowed *(Optional)*

Check this box if Asset Items of this type must have a transverse location across the carriageway by means of an XSP (cross sectional position). Valid XSP's are associated with Asset Types using XSP and Reversal Rules – NM0305. The default XSP description can be replaced with a specific description for the Asset Type using Asset XSP's – NM0306. For example, a valid XSP for a Network Type / Subclass may be defined as 'L - Left'. If an Asset Type of PASH – Pavement Shoulder has a valid XSP of 'L' the default XSP description (LEFT in this case) may be replaced with a more appropriate description for the Asset Type *e.g.*, LEFT SHOULDER. This description will be displayed on Asset Items - NM0510 if a Pavement Shoulder Asset Type is added with an XSP of 'L'.

Contiguous *(Optional)*

Check this box if Asset of this Type is mandatory along the entire length of a Network Element. Multiple Asset Items of this Type may be present but there can be no Overlaps or Gaps. Contiguous items, by implication, must also be 'Continuous'.

Consider the example in Figure 20.

Network Element H001/1-L has a length of 150m. Asset Type PAOR is used to record the details of the Original Pavement layer and is flagged as Contiguous. One of the defining attributes of the Original Pavement is the 'Base Material'. The Base Material from chainage 0-70 is Concrete but changes to Fine Crushed Aggregate for the remainder of the Network Element. To allow for the change in the attribute value, 2 Asset Items of Type PAOR are added, the first running from chainage 0-70 and the second running from chainage 70 to the end of the Network Element, thus ensuring that the Asset Type is Contiguous with no Gaps or Overlaps.

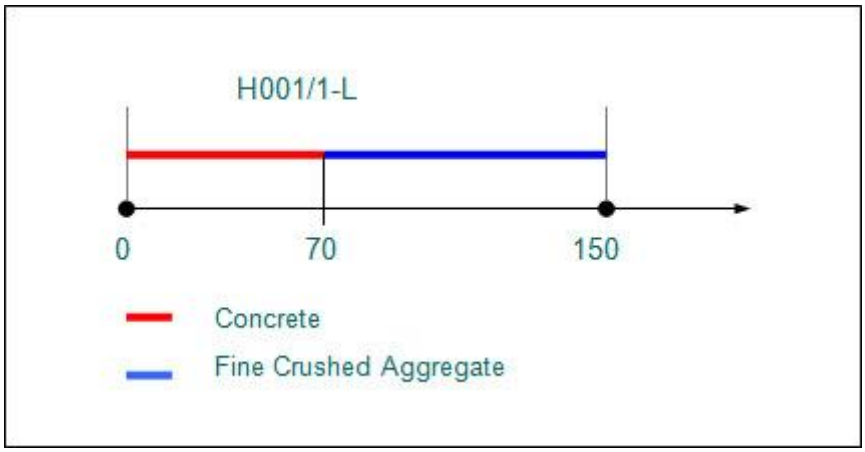

Figure 20 - Contiguous Asset Types

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Replaceable *(Optional)*

Check this box if Asset Items of this Type may be end-dated as a result of a Network Operation being carried out on the Network Element or Elements on which an Item of this Type is located.

Note: A Network Element cannot be 'Closed' (End-Dated) if any Asset Items that are either wholly or partially located on the Element are of an Asset Type which HAS NOT been flagged as 'Replaceable'.

Exclusive *(Optional)*

Asset Types may be flagged as 'Exclusive'. In simple terms this means that items of this Type may only exist once for a given Network Location. If the 'XSP Allowed' flag is also selected and the Asset Type can reside in Multiple XSP's, then exclusivity is applied within a given XSP, *i.e.*, many Items of an exclusive Asset Type may exist at the same linear offset but each must reside in a different XSP.

However, Exclusivity may also be applied by virtue of the value of an 'Exclusive Flexible Attribute' (see Attribute Check Boxes page 34). This means that many Items of an Exclusive Type may exist at the same linear offset within the same XSP, but the values of the 'Exclusive Flexible Attributes' must differ for each item. For example, an Asset Type of RUFF - Roughness may be flagged as Exclusive and have an Exclusive Attribute for 'Year'. This would mean that many Roughness Surveys could be located on the same extent of Network but each must have been surveyed in a different year.

Note: Exclusivity may only be applied to Attributes of Data Types of 'Number' and 'VARCHAR2' which are validated against an Asset Domain.

Reports or extracts such as Engineering Dynamic Segmentation (See Asset User Guide) where only a survey for a given year is required or reports on Structural Projects Road Construction Data where only specific Layer details are required may be facilitated by using the Asset Exclusive View Creation - NM0411 module (page 62) to create a 'Foreign Table Asset Type'. This Foreign Table Asset Type would then be used for reporting purposes.

Use XY(Optional)

This flag should be checked if Assets of this Type are to be located using Geographical Co-ordinates, *e.g.*, Grid References. If this is the case flexible Attributes should be defined in the Attributes panel to hold the coordinates. The IIT_X and IIT_Y columns must be used for the Easting and Northing Attributes respectively. These columns should be used when defining a GIS Theme for displaying Assets of this Type within the GIS.

Multiple Allowed *(Optional)*

Check this box if an Item of this type may have multiple 'disparate' locations. If this checkbox is selected the system will check for the existance of any location records already associated with an Asset Item when a new location record is added. The User will be prompted to either 'append' or 'replace' existing location records as shown in Figure 21.

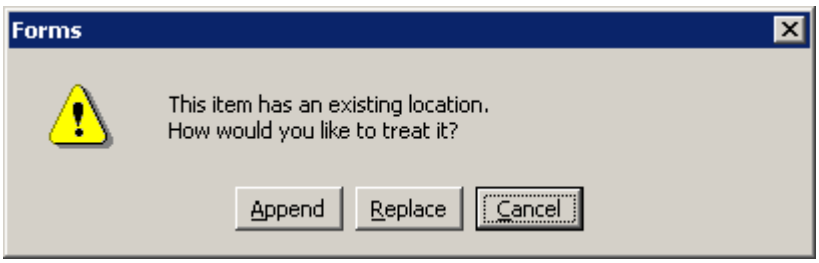

Figure 21

Note: The Multiple Allowed flag MUST be selected if a Continuous Asset Item of this Type is to Span a Distance Break.

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End Location Only *(Optional)*

Check this box if Asset Items of this type are to remain 'open' *i.e.,* Not End Dated, if the Network Element to which it is associated is End Dated. The Location Record however will be End Dated; therefore the Asset Item will no longer be 'pinned' to a Network.

Note: If this flag is 'checked' the 'Replaceable' flag should also be 'checked'.

Top in Hierarchy *(Optional)*

Check this box if Asset Items of this Type are used within an Asset Hierarchy and this Asset Type is at the Top Level.

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2.3.7 **Attributes**

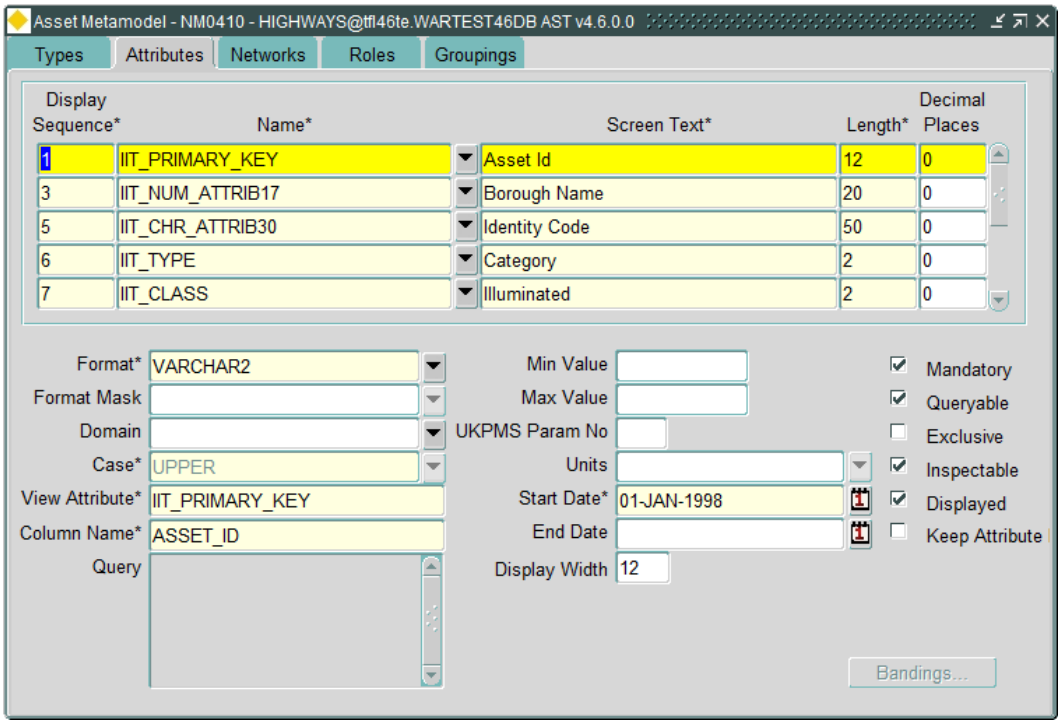

Figure 22 - Attributes

This window is used to manage the Table Columns used to store the defining characteristics of the Asset Type. These characteristics are called flexible Asset Attributes.

Managing Asset Attributes held within Exor requires careful planning and a basic understanding of how the information is stored.

The Columns available for use as flexible Asset Attributes come from a single Database Table held within Exor. A Database Table basically consists of the following:

- A fixed number of vertical columns of data. Each column can contain information relating to a particular characteristic of an Asset Item.
- A variable number of horizontal rows, each row containing details of an Asset Item.

Note: If an external table or databse view is being used to hold the Asset data, the Attribute Column Names will be validated against the Column names of the external table.

On the previous Window a View name was created. When this Database View is created by pressing the [Create View] button on the 'Types' window only the Columns selected for the Asset Type are included, ensuring that only the relevant Columns are displayed when using the Asset Type. The use of these Asset Views is totally transparent.

When you enter this window any Attributes already defined for the selected Asset Type will be displayed. To add another Attribute press the [Create Record] button on the menu toolbar [or press F6].

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Display Sequence ***(Required)***

Enter a sequence number that will order this Attribute in relation to other Attributes for this Asset Type.

Name ***(Required)*** ***List***

Enter the Table Column name to hold the Attribute data. When selecting a Column it is preferable to select one of the same Data Type as the information to stored. For example, if the Asset Attribute is a Date, then a Column of Type 'Date' should be selected. Similarly, if the Asset Attribute is a numeric value, then a Column of data type 'Number' should be selected. The datatype of each Column will be displayed in the List of Values.

If an appropriate Column is not available (as it may have already been selected for another attribute of this Asset Type) a data type format can be set using the 'Format' field to ensure the input data conforms to the data type of the column being used to store the information.

Screen Text ***(Required)***

Enter the text that the User will see when using this Asset Attribute.

Length ***(Required)***

Enter the maximum number of digits allowed for this Asset Attribute.

If this Attribute is to use an Asset Domain, and hence have an associated List of Values, the Length entered for this Attribute must not be less than the maximum number of digits used for any Value of the Asset Domain.

If the Attribute is used to store Numeric data with decimal places, the decimal point is not considered when calculated the number of digits required. For example, if the Attribute has a precision of 2 decimal places and the maximum value for the Attribute is 100.00, then the Length required to store this information would be 5.

Decimal Places ***(Optional)***

If a Asset Attribute is used to store numeric data with decimal places, enter the maximum number of decimal places allowed this value cannot be greater than the value returned for the selected column.

Format ***(Required)*** ***(List)***

Select the Data Type to be used with the selected Column. This should match the Data Type of the Attribute Values being entered and may be different than the Default Data Type of the selected Table Column. For example, if a Column of type Varchar2 is selected, but the Values being input into this Attribute are numeric, the Format can be set to 'Numeric' thus allowing only numeric data to be entered.

Valid Formats are set-up using Domains – HIG9120 and by updating domain DATA_FORMAT.

Format Mask ***(Optional)***

A format mask may be applied to an Attribute in order for data to be displayed in a consistent format. For example, if a format mask of DD/MM/YYYY is applied to a Date Attribute, the date will always be displayed in this form *e.g.*, 01/01/2001. The Format Mask only affects how the value is displayed, not how it is stored in the table. A Format Mask is only applied once that data has been entered and nothing is displayed in the field to suggest or control the format in which data is entered.

Valid Format Masks for Dates are set-up using Domains – HIG9120 and by updating domain DATE_FORMAT. A Format mask may also be used if the Data Type selected in the 'format' field is NUMBER, *e.g.*, 00.00

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Domain ***(Optional)*** ***(List)***

If the selected Asset Attribute uses a List of Values to validate data entry, enter the Domain name from which to select the valid values. The Domains and associated list of values must have already been defined using Asset Domains - NM0301. The list of available Domains will only display those whose Data Type matches the Data Type selected for the Attribute.

Case ***(Required)*** ***(List)***

Defines the case of the selected VARCHAR2 attribute, defaults to UPPER for NUMBER and DATE format attributes.

View Attribute ***(Required)***

Enter a Name for the View Attribute. The View Attribute name is used in the naming of a Column created in several Database Views if this Attribute is used as a 'Splitting' agent in a Merge Query definition.

Column Name ***(Required)***

Enter a name for the Column, which will be displayed in the View of the Asset Type, for this Attribute. For example, if the Screen Text for the Attribute was 'Survey Id', then the Column Name in the View may be called 'IIT_SURVEY_ID'.

Note: Spaces are not permitted in View Column Names.

Query ***(Optional)***

This field is currently only used within Street Gazetteer Manager to create a dynamic List of Values for use with Associated Street Data. Street Gazetteer Manager is shipped with standard queries that must not be changed.

Min Value ***(Optional)***

Enter the minimum value allowable for this Attribute.

You may only enter a value in this field if the data Format selected is 'NUMBER'

Max Value ***(Optional)***

Enter the Maximum Value allowable for this attribute. You may only enter a value in this field if the data Format selected is 'NUMBER'.

UKPMS Param No ***(Optional)***

Enter the UKPMS Parameter Number for this Asset item

Note that this field is only used in conjunction with UKPMS and mobile data capture (text based option)

Units ***(Optional)*** ***(List)***

If the Format for the selected Asset Attribute is 'Numeric', the Unit of measurement used for Asset Attribute may be entered here. The Unit Description will be displayed in the adjacent field to the Attribute value in the Asset Items Attribute - NM0510 window.

These Units must have already been set up using Units and Conversions – HIG1820 and if appropriate Conversion Functions have been defined for the selected Unit, 'Dynamic Unit Conversion' may take place in the appropriate forms.

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Start Date *(Required)*

Enter the date from which the Asset Attribute is valid.

End Date *(Optional)*

Enter the date from which the Asset Attribute is ceases to be valid.

Display Width

When displaying at Asset Attribute within the Results Grid of the Locator Module, the column Width within in Grid may be defined using this field. If left blank (null), the Grid Column width is determined in accordance with the Attribute length. This field is only available if the 'Displayed' Checkbox is selected.

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2.3.8 Attribute Checkboxes

Mandatory

Check this box if a Value must always be present for this Attribute. A '*' will be displayed beside the Attribute Name in the Asset Items – NM0510 form to signify the Attribute is Mandatory.

Queryable

Check this box if the Asset Attribute can be used as a selection criteria parameter to query Asset Items of this Type using the Locator – NM0572 search facility or Find Assets – NM0570 (Refer to the Asset Manager Use Guide).

For example, if you have an Asset Type 'RACR' – Crossing Type, which has an Attribute for Crossing Type, flagging this Attribute as 'Queryable' would allow you to select particular Crossings using the Asset Type code 'RACR' and Crossing Type.

Exclusive

Check this box if Items of this Asset Type are exclusive by virtue of the value of this Attribute. This means that many Items of an Exclusive Type may exist at the same linear offset within the same XSP, but the values of the 'Exclusive Flexible Attributes' must differ for each item. For example, an Asset Type of RUFF - Roughness may be flagged as Exclusive and have an Exclusive Attribute for 'Year'. This would mean that many Roughness Surveys could be located on the same extent of Network but each must have been surveyed in a different year. Exclusivity may only be applied to Attributes of Data Types of 'Number' and 'Varchar2' that are validated against an Asset Domain. Exclusive Attributes must also be flagged as 'Mandatory'.

Note: Asset Type Attributes cannot be flagged as Exclusive when the Asset Type is not flagged as Exclusive.

Inspectable

Check this box if the Asset Attribute is to be downloaded to the edif file for map capture or a 3rd party mobile application.

Displayed

Check this box if the Asset Attribute is to be displayed within the Results Grid of the Locator Module.

Keep Attribute History

This checkbox is only used in conjunction with Map Capture by Exor. If this option is selected a history of any changes made to the value of this Attribute within Map Capture will be kept even when the Inspector chooses not to keep history within Map Capture.

Note: This option is only available if Product Option MAPCAPTURE is set to 'Y'.

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2.3.9 **Attribute Bandings Button**

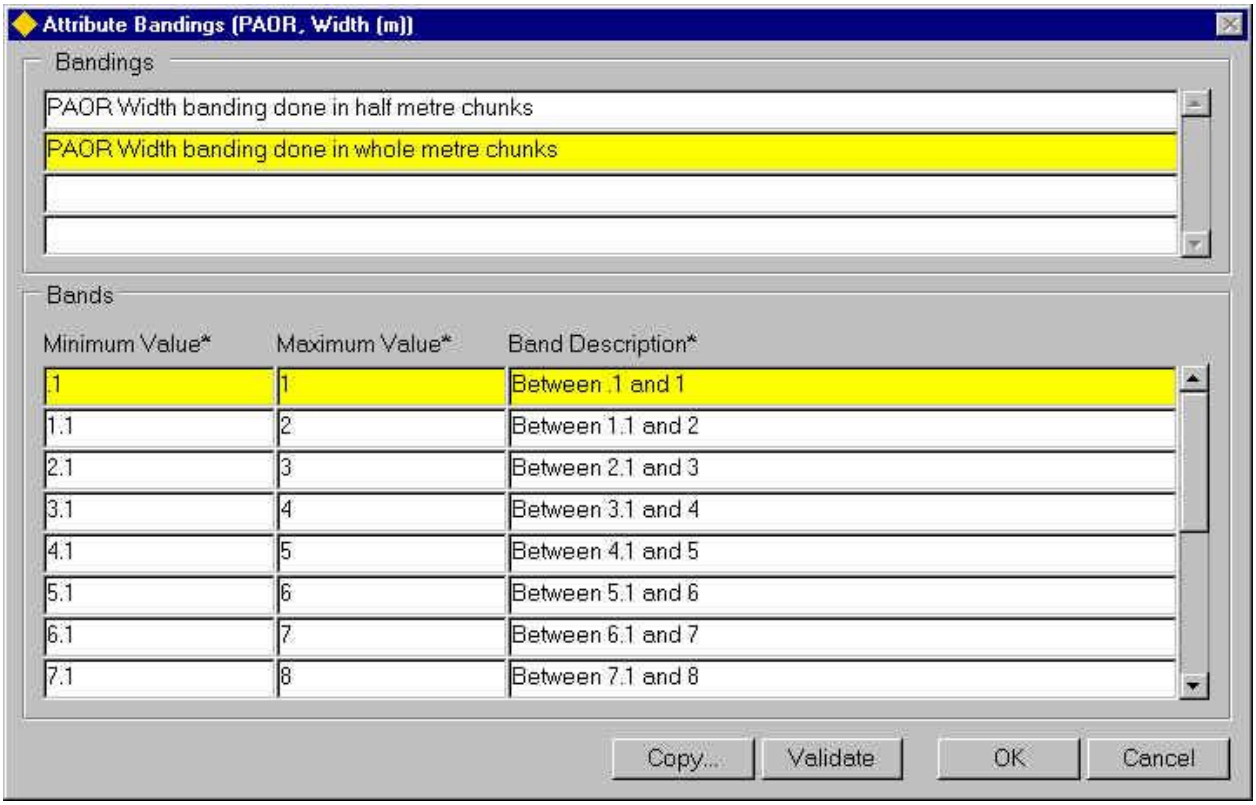

Figure 23 - Attribute Bandings

Asset Attribute values may be 'Banded' for use when using the 'Banded' Asset Item Attribute and associated Asset Item Type as a 'Splitting' agent combination when defining a Merge Query Setup – NM7050 or specifying Merge Query Defaults – NM7053.

An Asset Attribute may have several different Bandings defined. For example, an Attribute to record pavement width may have a Banding to 'group' values every half metre and another Banding to 'group' values every 1metre.

When an Asset Item Attribute Banding is used in a Merge Query Setup the resultant Composite Items are 'grouped' together, according to the Band Widths specified in the Merge Query Setup, to form a single Composite Item within the appropriate Band Width.

Figure 25shows the results of a simple Merge Query for Pavement Original Items of Width < 7.2 m. The results are displayed using Spatial Data Manager by Exor and shows the results both with and without an Attribute Banding applied to highlight the difference.

When specifying Band Widths, *i.e.*, Minimum and Maximum Values, no Gaps or Overlaps are allowed. To check the entered Band Widths press the [Validate Button] on the form. If any errors are detected a message will be displayed as show in Figure 24.

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Figure 24 – Banding error

If the Banded Attribute is of data type NUMBER the precision of the Banded Width is determined by the number of decimal places specified for the Attribute.

Note: Only Asset Attributes with a Format of NUMBER or DATE may be banded.

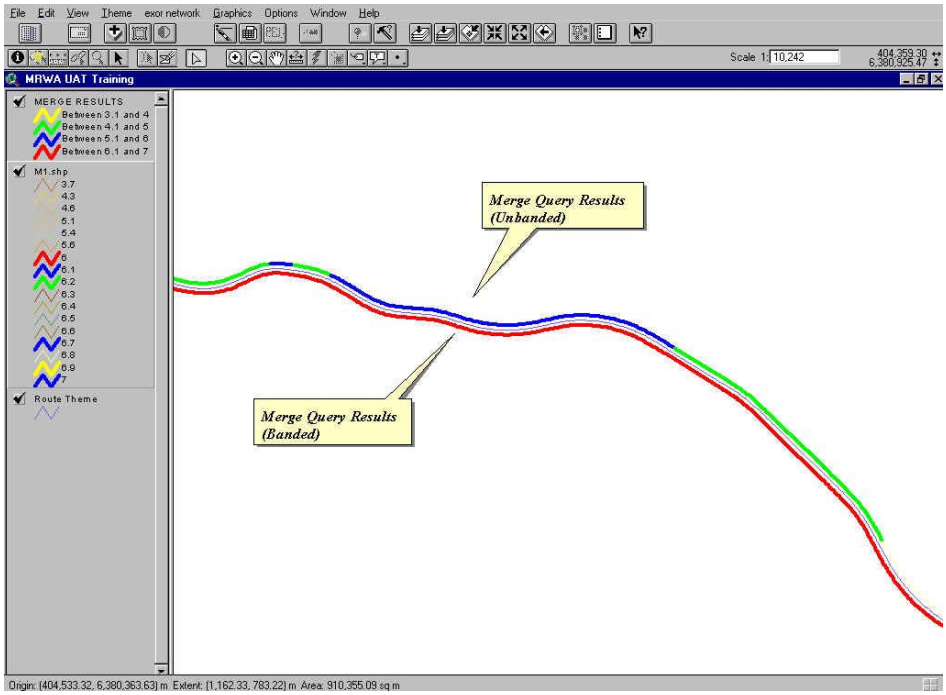

Figure 25 - Banded Attribute Results

Bandings *(Required)*

Enter a Description for the Asset Attribute Banding. A maximum of 60 characters is allowed.

Minimum Value *(Required)*

Enter the minimum value of the Band Width.

Maximum Value *(Required)*

Enter the maximum value of the Band Width.

Note: No Gaps or Overlaps are allowed.

Band Description *(Required)*

Enter a Description of the Attribute Band Width. A maximum of 60 characters is allowed.

To check the Bandings press the [Validate] button.

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2.3.10 **Copy Banding Button**

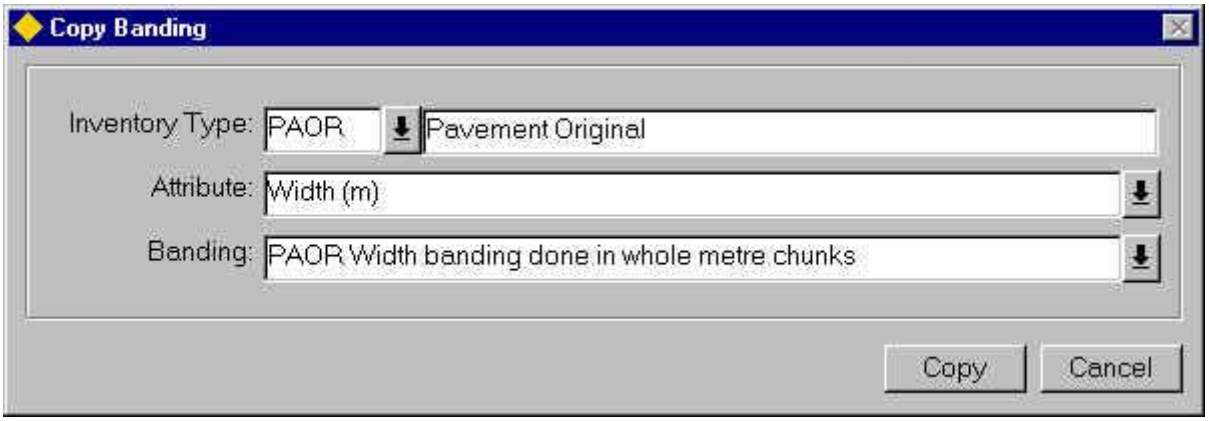

Figure 26 - Copy Bandings

Asset Bandings may be copied between Asset Types or between Attributes of the same Asset Type using the [Copy] button on the form.

Note that when copying Numeric Bandings the precision specified MUST match the number of decimal places defined for the Attribute to which the Banding is being copied.

Asset Type ***(Required)*** ***(List)***

Select the Asset Type from which to copy the Attribute Banding. The List of Values will display only the Asset Types which currently have Attribute Banding defined.

Attribute ***(Required)*** ***(List)***

Select the Attribute from which to select the Banding to copy. The List of Values will display only the Attributes of the selected Asset Type that are currently Banded.

Banding ***(Required)*** ***(List)***

Select the Attribute Banding to copy from.

To copy the Banding press the [Copy] button on the form.

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2.3.11 **Network Types**

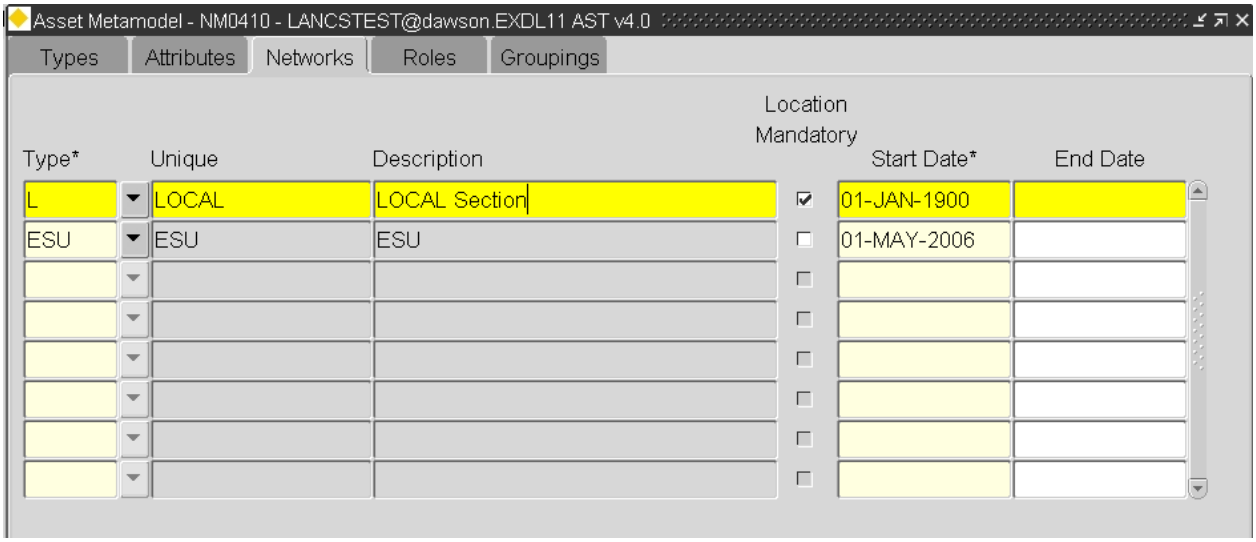

Figure 27 - Network Types

This window is used to define on which Network Types Asset Items of the selected Type can be located. Asset Types can 'belong' to a single Network Type or be 'shared' by multiple Network Types allowing Assets to span multiple Datum Types.

Assets which are not directly located on a Network may also be modelled. These are referred to as Off Network Assets. Refer to page 48 for more information relating to Off Network Assets.

Only Network Types Flagged as being 'Datum' Network Types in Network Types – NM0002, can be selected in this window.

When you enter this window any Datum Network Types already selected for the Asset Type will be displayed. To add another Datum Network Type press the [Create Record] button on the menu toolbar [or press F6].

Type ***(Required)*** ***(List)***

Enter the Network Type on which Asset Items of this Type may be located. Note that Only Network Types Flagged as being 'Datum' Network Types in Network Types – NM0002, can be selected in this window.

The Unique Network Type Code and Description will be displayed in the adjacent fields.

Location Mandatory ***(Check Box)***

Check this box if an Asset Item of the selected Type must have a location record on the selected Network Type.

Note: When an Asset Item of this type is added a message will be displayed informing the User that it must be located.

Start Date ***(Required)***

Enter the date from which the association of the selected Asset Type and Network Type is valid.

End Date ***(Required)***

Enter the date from which the association of the selected Asset Type and Network Type ceases to be valid.

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2.3.12 **Roles**

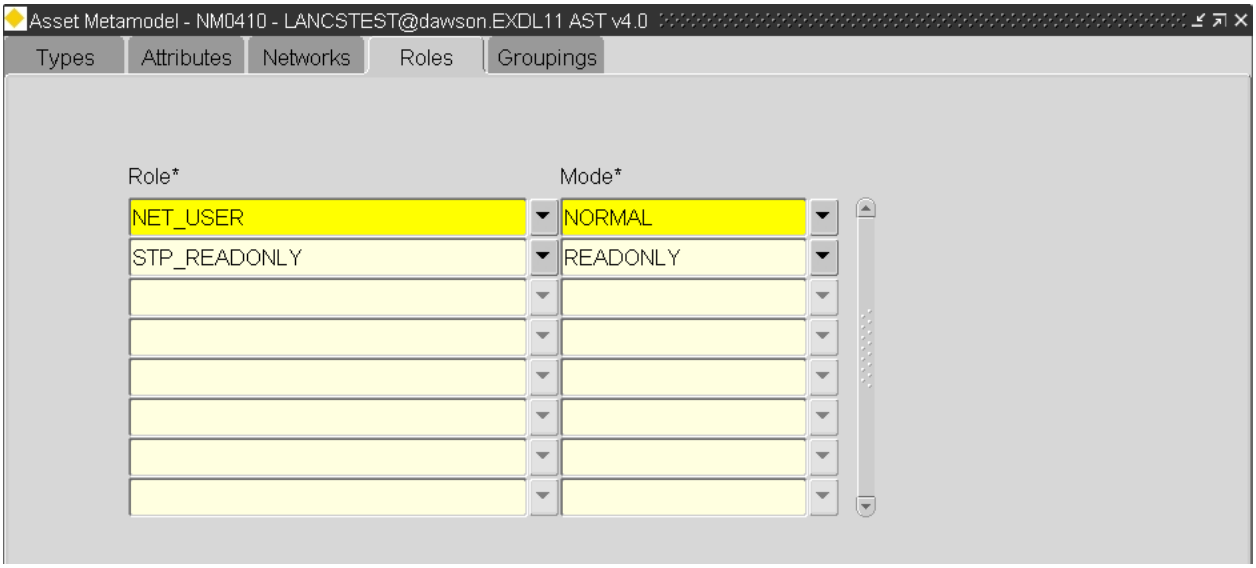

Figure 28 - Asset Roles

This window is used to specify the User Roles necessary to have access to Asset Items of this Type and the Mode of Access a User has. Note that although a User may have been granted an appropriate Role to access this Asset Type, the User will still only have access to Asset Items of this Type that conform to the Admin Unit security imposed. User Roles will have been previously set up using Roles - HIG1836.

When you enter this window any User Roles already selected for the Asset Type will be displayed. To add another User Role, press the [Create Record] button on the menu toolbar [or press F6].

Role ***(Required)*** ***(List)***

Enter the Role a User must have to access Asset Items of this Type.

Mode ***(Required)*** ***(List)***

Enter the Mode of access the User may have. Valid entries are:

- Normal (Read and Write permissions to the Database)
- Read-only (No Write permissions to the Database)

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2.3.13 **Asset Groupings**

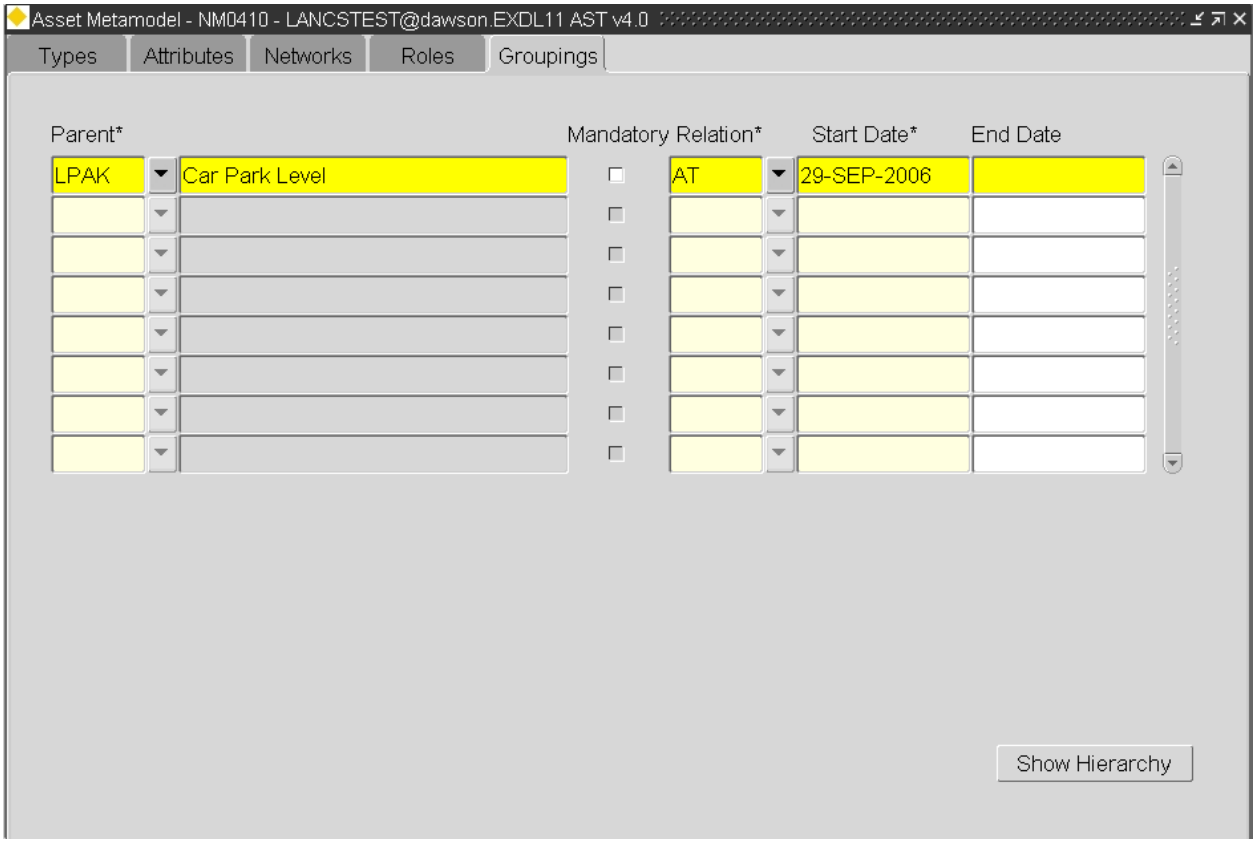

Figure 29 - Asset Groupings

The Asset Manager Metamodel supports the grouping of Asset Types to form a multi tier Asset Hierarchy. This window is only used if the currently selected Asset Type is used in an Asset Hierarchy. It is used to specify the 'Parent' Asset Type and its location relative to its Parent Item. If Asset Items of the currently selected Asset Type may be located on different Network Types, it may have multiple 'Parent' Types, *i.e.*, a Parent Type for each Network Type. An Asset Type may have only one 'Parent' Type on any given Network Type.

Asset with a Parent Child relationship is referred to as Hierarchical Asset.

An item of Asset may have many different type of 'Child' items, but a 'Child' item can only have 1 'Parent' Item. If the Asset Grouping relationship is flagged as Mandatory, the 'Child' Asset Item cannot be 'orphaned', *i.e.*, an Asset Item of the Type that has a 'Parent' Type defined in the Groupings window of the Asset Metamodel - NM0410 form cannot exist without existence of the 'Parent' Asset Item.

The Complete Hierarchical relationship of Asset Type Groupings can be displayed by pressing the [Show Hierarchy] button on the Groupings window.

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Figure 30 shows a simple example of Asset Groupings.

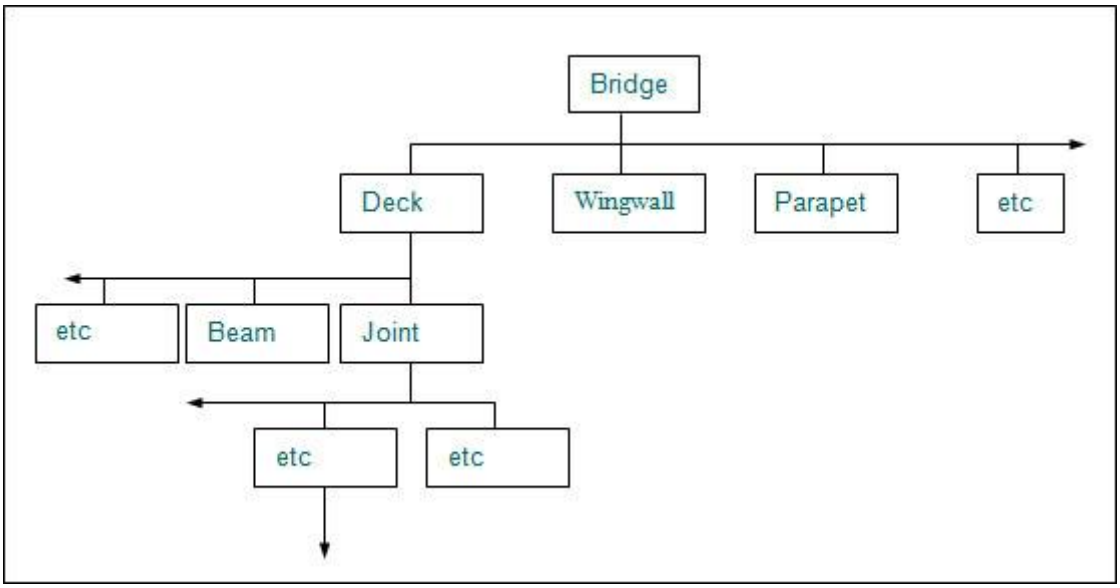

Figure 30 - Asset Groupings (Hierarchical Asset)

Asset Types which are used in a Hierarchy must have special Attributes defined to create the 'Join' between the 'Parent' Item and the 'Child' Item(s), as well as the other defining Attributes for the Asset Type. The Table Column names that are used to establish the Asset Grouping relationship are IIT_PRIMARY_KEY and IIT_FOREIGN_KEY.

Each hierarchical Asset Item of a given Asset Type that is to be a 'parent' at any level within an Asset Grouping must have an Attribute that uses the table column IIT_PRIMARY_KEY.

If an Asset Item is a 'child' within an Asset Grouping it must have an Attribute that uses the table column IIT_FOREIGN_KEY.

When the 'Parent' Item is added to the database, a Value will be entered into the 'Primary Key' Attribute for the Asset record. When a subsequent 'child' item is added, the IIT_FOREIGN_KEY attribute of the 'child' item will be populated with the same value given to the Primary Key Attribute of the 'Parent' Item, thus establishing the Asset Grouping relationship. Note that some items within a multiple tier hierarchy may be 'parent' AND 'child' items. The Deck Item Type in Figure 31 is an example.

Figure 31 shows a simple 3 level Asset Grouping and the respective relationships of the Asset Items

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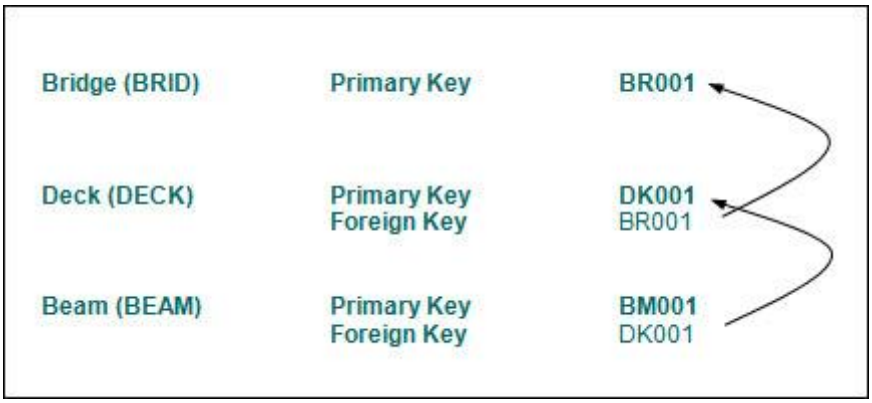

Figure 31

In this scenario the Asset Type of DECK, as well as being a 'child' item of the BRIDGE Type, is also the 'parent' of the Asset Type BEAM. Therefore the Asset Type 'BEAM' must have a Foreign Key to the DECK.

Asset Groupings can only be defined for Asset Types NOT flagged as being 'Top in Hierarchy'. If the Groupings tab is pressed for Asset Items that are 'Top in Hierarchy' the warning message displayed in Figure 32 will be displayed.

Figure 32 - Groupings Warning Message

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2.3.14 Groupings

When you enter this form any Asset Types already setup in the Asset Grouping will be displayed. To add another Asset Type to the Grouping press the [Create Record] button on the menu toolbar or press (F6).

Note: An Asset Type may have only one 'Parent' Type on any given Network Type.

Parent ***(Required)*** ***(List)***

Enter the Parent Asset Type. The Valid Asset Types, which will appear in the List of Values, will only include those Asset Types that are flagged as being 'Top in Hierarchy' or those which are already part of an Asset Grouping.

The Asset Type description will be displayed in the adjacent field.

Consider the example below.

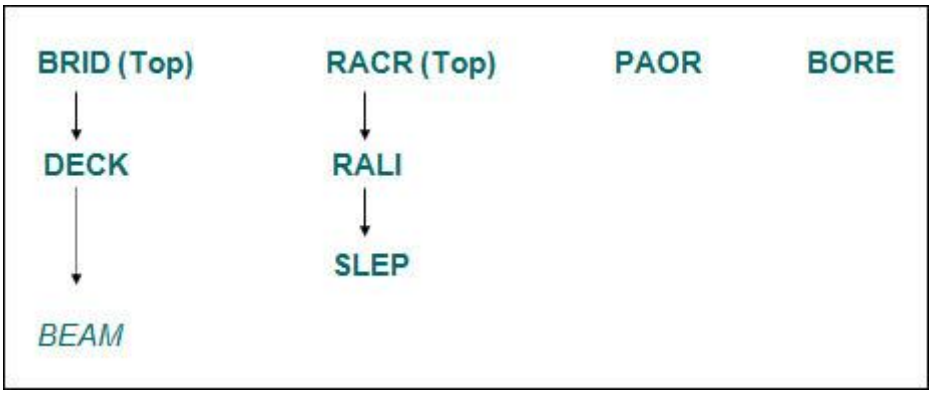

Figure 33 – Asset Groupings

A new Asset Type of BEAM is being added to the database. It will be a 'child' of type DECK, which in turn is a 'child' of type BRID. Asset Types BRID and RACR have been flagged as being 'Top in Hierarchy'. The other Asset Types shown already exist within the Asset Metamodel.

When the List of Values of valid Parent Asset Types is displayed for the BEAM, it will contain Types BRID and RACR, as they are flagged as Top in Hierarchy, and Types DECK, RALI, SLEP as they are already included in an Asset Grouping. Types PAOR and BORE will not be valid entries as they do not meet either of these criteria.

Mandatory ***(Check box)***

Check this box if an Asset Item of the currently selected Type cannot exist without the existence of its 'parent' item, *i.e.*, it cannot be orphaned. If the Flag is selected the Location of the 'Child' Item will be end dated if the Location its 'Parent' item is End Dated.

Relation ***(Required)*** ***(List)***

Enter the locational relationship of the Asset Grouping. The valid entries are:

IN, AT, NONE, DERIVED

IN	The 'child' item must be wholly located within its 'parent' item location.
AT	The 'child' item must be located at the same location as its 'parent'
NONE	There is no relationship between the location of the 'child' item and it's 'parent' item.

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DERIVED The Relationship between the 'Parent' and 'Child' Item is established by the location of the 'child' item within the extent of the 'parent' item. Note that the existence of the 'child' item is not reliant on the existence of the 'parent' item, *i.e.*, the Child Item may be an 'orphan'. Derived locations are mainly used for traffic modelling.

Start Date ***(Required)***

Enter the date from which the Asset Grouping is effective.

End Date ***(Optional)***

Enter the date from which the Asset Grouping ceases to be effective.

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2.3.15 **Show Hierarchy**

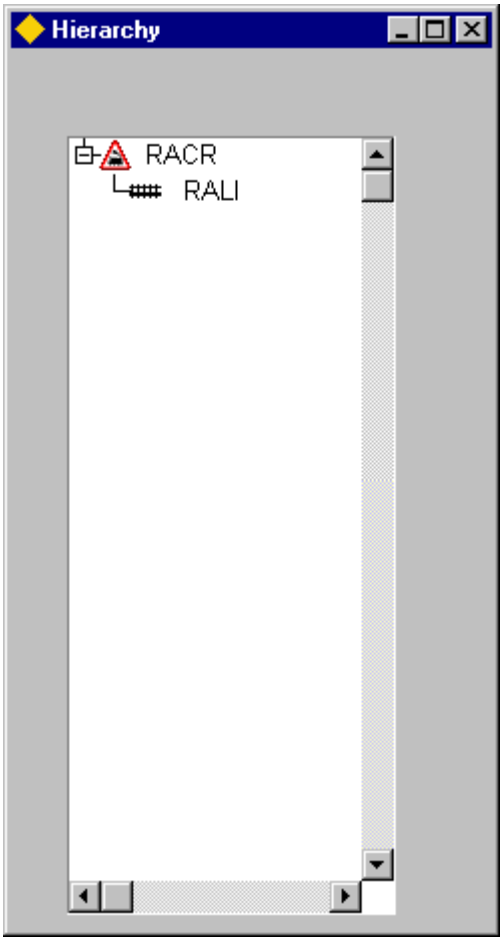

Figure 34 - Show Hierarchy

To view a pictorial representation of the Asset Grouping press the [Show Hierarchy] button on the Groupings window. If an Icon Name has been entered for the Asset Type, this Icon will be used in the diagram to symbolise the Asset Type.

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2.3.16 **Display View Text**

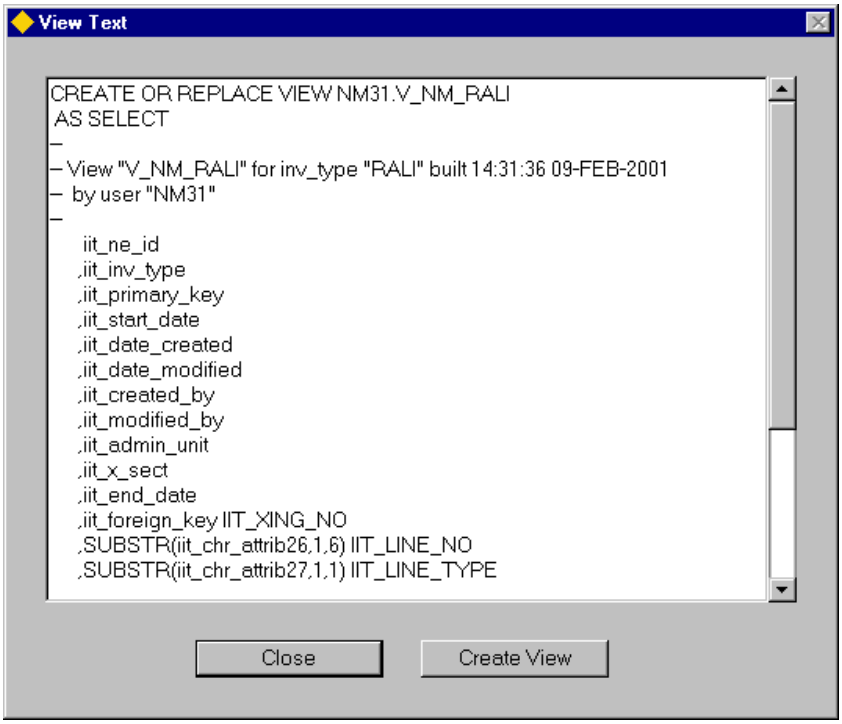

Figure 35 - Display View Text

To view the SQL*Plus statement used to create the database view of this Asset Type press the [Display View Text] button.

Database Views can be used to 'filter' only the required information from very large table thus enhancing system performance. The Asset Views are used in some reporting facilities and could also be used when creating a GIS theme to display Asset Items of this type. The use of Database Views is totally transparent to the User.

To create the Database view press the [Create View] button. An information dialog box will be displayed (Figure 36) to indicate the View has been successfully created.

Figure 36 - View created dialog

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If Product Option INVVIEWSLK is set to 'Y' (Product Options are maintained using HIG9130) the Route and Route Offset details for the 'Parent' Linear Network Type defined within Network Types - NM0002 (see Network Admin Guide) will be included in the Asset View. The following columns will be added to the view:

DATUM_NE_UNIQUE	Unique Datum Element Reference
ROUTE_NE_UNIQUE	Unique 'Parent' Route Reference
ROUTE_NE_ID	Internal System Route Id
ROUTE_SLK_START	Inv Start Point relative to Route
ROUTE_SLK_END	Inv End Point relative to Route

Note:

This Product Option should be set to 'N' under the following circumstance:

Multiple Linear Parent Type Inclusions exist

No Linear Type Inclusions exist

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2.3.17 **Off Network Assets**

Many Organisations are responsible for the management of Assets that are not located directly on a Network. These may include Parks, Grassed Area's and Playgrounds for example. Such Assets are referred to as 'Off Network Assets'.

Using Exor's Asset Management solution these Off Network Assets can be created and maintained in the same manner as any other 'located Asset' within the Exor database.

As well as Assets with no network-based location, the Exor system can also 'Netcode' point Assets that have an XY coordinate location. Exor's Netcoding functionality allows a Network Location to be derived from the XY coordinates of an Asset, by 'snapping' it to the nearest allowable Network Location.

Netcoding enables Asset Surveys (for point items) to be carried out using GPS devices where the actual geographic position of the Asset is collected as an alternative to traditional 'chainage' based surveys. When these Assets are loaded or entered into the Exor System they can be automatically Netcoded and given a network based location allowing subsequent network based analysis to be carried out.

Note: That Netcoding does not update the XY coordinates of the Asset.

Figure 37 shows an example of a Street Light that has been collected using a GPS system. Upon loading into Exor it has been Netcoded to derive a Network based location.

Figure 38 shows the Asset with its location in the Asset Items – NM0510 module.

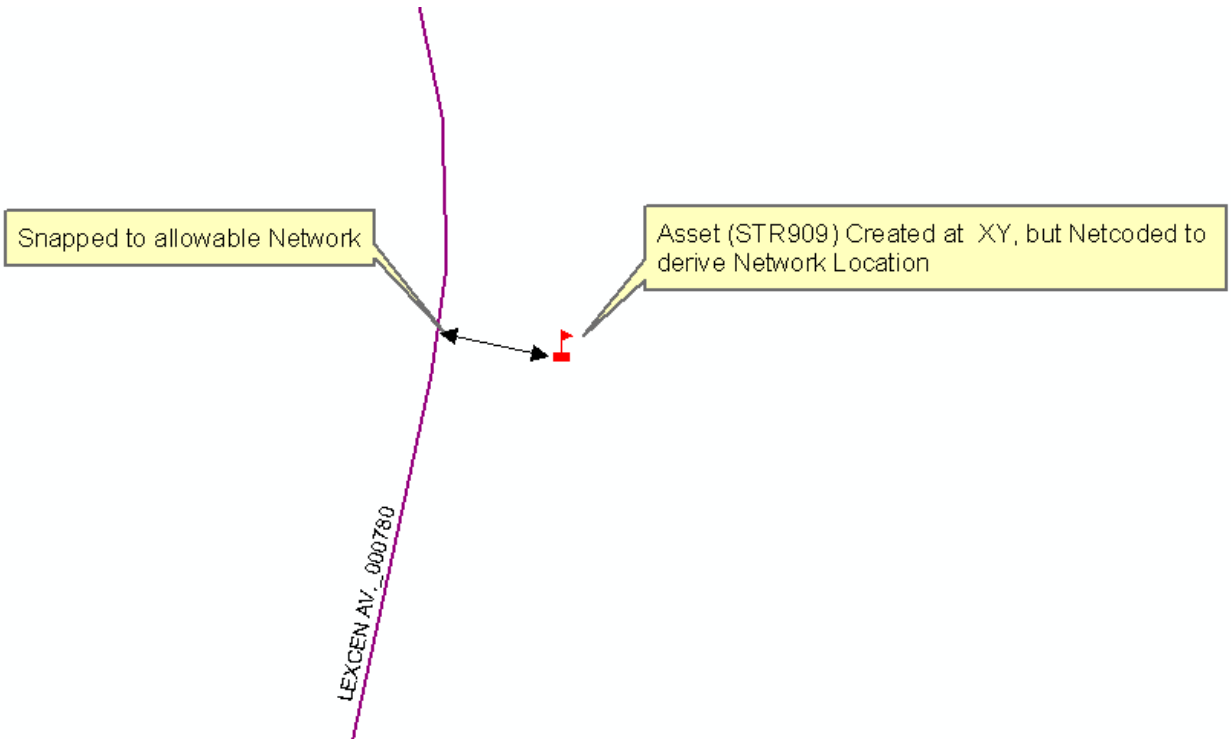

Figure 37 – Asset Snapped to the Network

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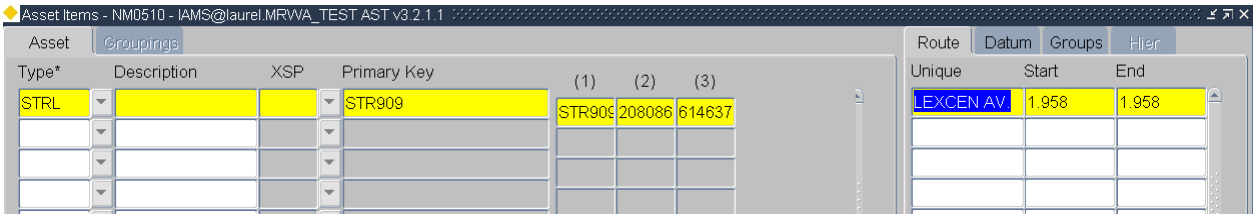

Figure 38

Off Network Assets fall into one of 3 categories. These are:

- Assets (Point, Line or Polygon) with no defining XY coordinate which are not located on any Network
- Assets (Point, Line or Polygon) with a defining XY coordinate which are not located on any Network
- Assets (Point, Line or Polygon) with a defining XY coordinate which are Netcoded to derived a Network Based Location

The use of each is explained below. Refer to the Spatial Server Administration Guide for details on how to create Spatial Layers.

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2.3.18 **Assets with no XY or Network Reference**

These are Asset Types, which have no defining XY coordinate position (*i.e.*, the Asset Type is not flagged as 'Use XY') and have no associated Network Type defined in the 'Networks' tab.

When the Spatial Layer for these Asset Types is created using the [Create Layer] button, the layer will contain no spatial data as the system has nothing from which to drive the creation of the spatial geometry.

Spatial Manager allows the creation and maintenance of new Assets of this type along with their spatial geometry. These Assets may also be created and maintained within forms such as Asset Items – NM0510 but any Assets created within the forms environment will have no associated 'shape'.

Figure 39 shows an example of an Off Network Asset (Embankment) that has a geometry type of 2003 – 2D Polygon. The Asset has no Network Location and does not use and attributes to store XY coordinates.

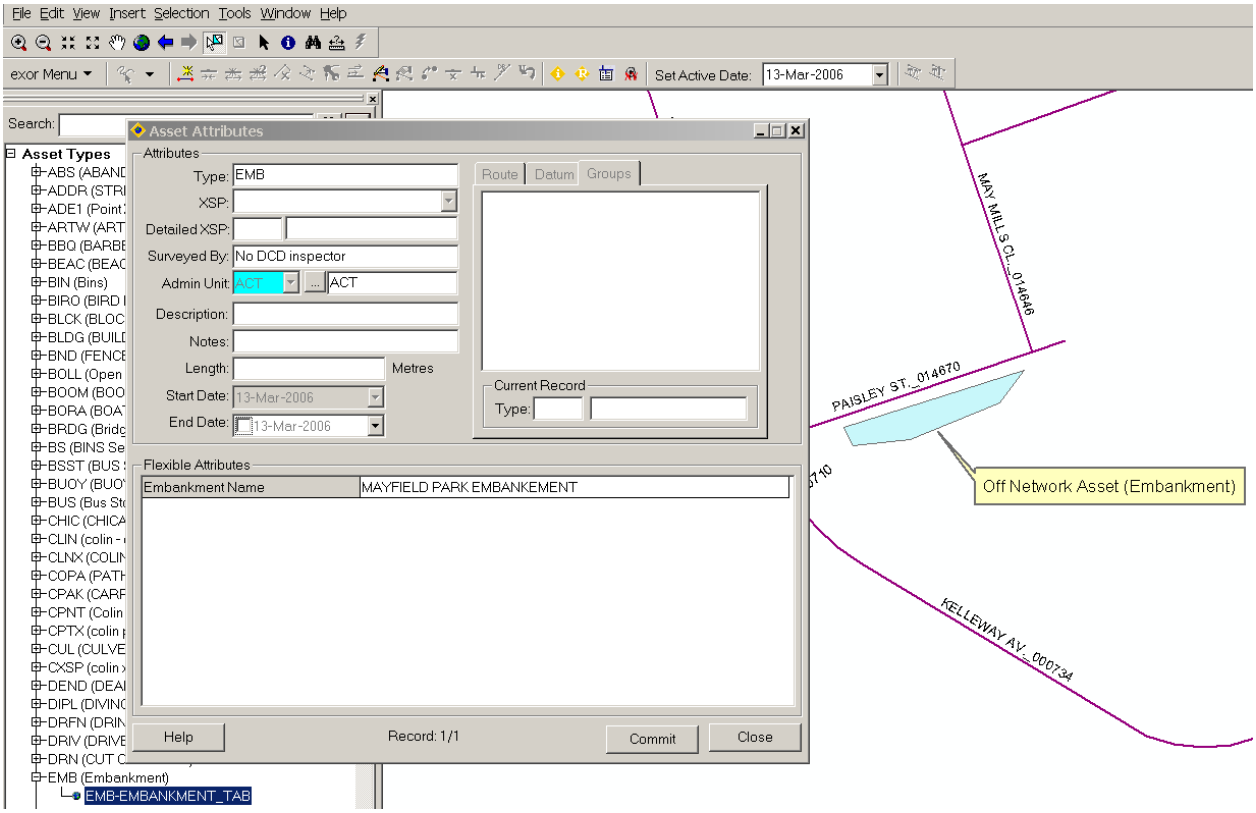

Figure 39

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2.3.19 Assets with defining XY coordinates but no Network Reference

These are Asset Types that have a defining XY coordinate position (*i.e.*, the Asset Type is flagged as 'Use XY') but has no associated Network Type defined in the 'Networks' tab.

Note: If Assets of this type are loaded using the CSV loaders for example, the spatial geometry for each Asset will be automatically created if the X and Y values are present.

The IIT_X and IIT_Y columns must be defined as the columns used to store the X and Y coordinates respectively.

When the Spatial Layer for these Asset Types is created using the [Create Layer] button, spatial data will be created for Point Asset Types only, *i.e.*, no spatial data will be created for line or polygon Asset Types (this is determined by the Geometry Type defined for the GIS Theme, *e.g.*, 2002 – 2D Line or 2003 – 2D Polygon). The spatial geometry of point Assets is created based upon the values present in the IIT_X and IIT_Y attributes of each Asset.

Assets of this type may be created within both Spatial Manager and the forms Environment. The tables below show the expected behaviour for each type of Asset.

Table 5

Environment	***Spatial Manager***		
Asset Type (Geometry Type)	***Create Asset and spatial geometry***	***Reshape / Relocate Asset***	***IIT_X and IIT_Y attributes automatically updated***
Point (2001 – 2D Point)	Yes	Yes	Yes
Line (2002 – 2D Line)	Yes	Yes	No
Polygon (2003 – 2D Polygon	Yes	Yes	No

Figure 40 shows an example of a Point Asset Type (Geometry Type 2001 – 2D Point) Off Network Asset that has been created within Spatial Manager. Note that the X and Y coordinates have been automatically populated.

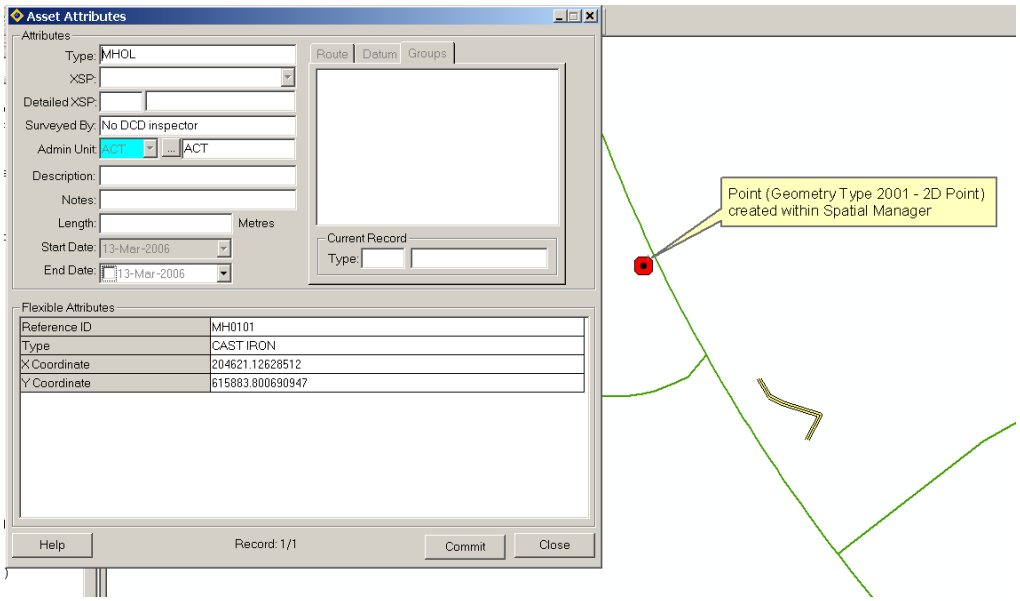

Figure 40

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Figure 41 shows an example of Line Type (Geometry Type 2002 – 2D Line) Off Network Asset which was created within Spatial Manager. Note that the X and Y coordinate values have not been updated.

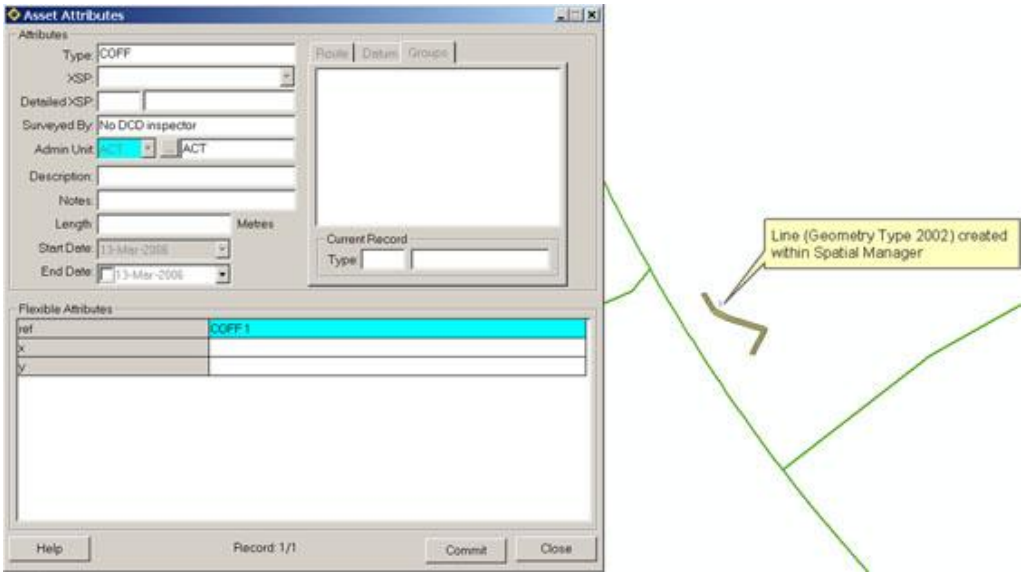

Figure 41

When creating these types of Assets within the Forms environment the spatial geometry is only created for Point assets (Geometry Type 2001). The shape is driven from the values entered into the IIT_X and IIT_Y attributes.

Environment	***Forms***		
Asset Type (Geometry Type)	***Create Asset and spatial geometry by entering XY values***	***Reshape / Relocate Asset***	***IIT_X and IIT_Y attributes automatically updated***
Point (2001 – 2D Point)	Yes	Yes	N/A
Line (2002 – 2D Line)	No	No	N/A
Polygon (2003 – 2D Polygon	No	No	N/A

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Figure 42 shows an example of a Point Asset Type (Geometry Type 2001 – 2D Point) Off Network Asset that has been created within the forms environment. The X and Y coordinates have been typed in by the User. The system will automatically create the spatial geometry and allow the Asset to be displayed spatially.

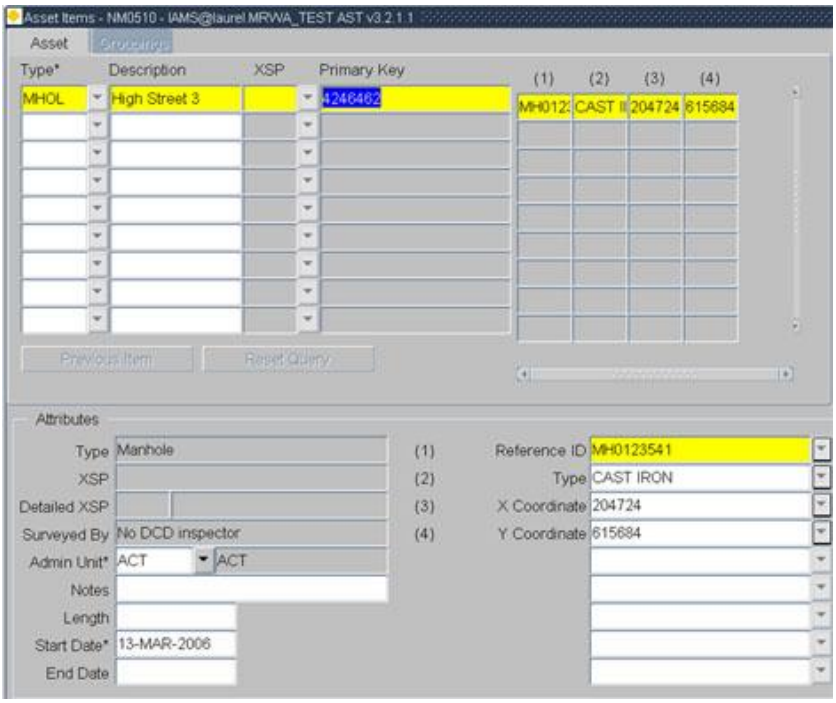

Figure 42

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Figure 43 shows the same Asset within Exor MapViewer.

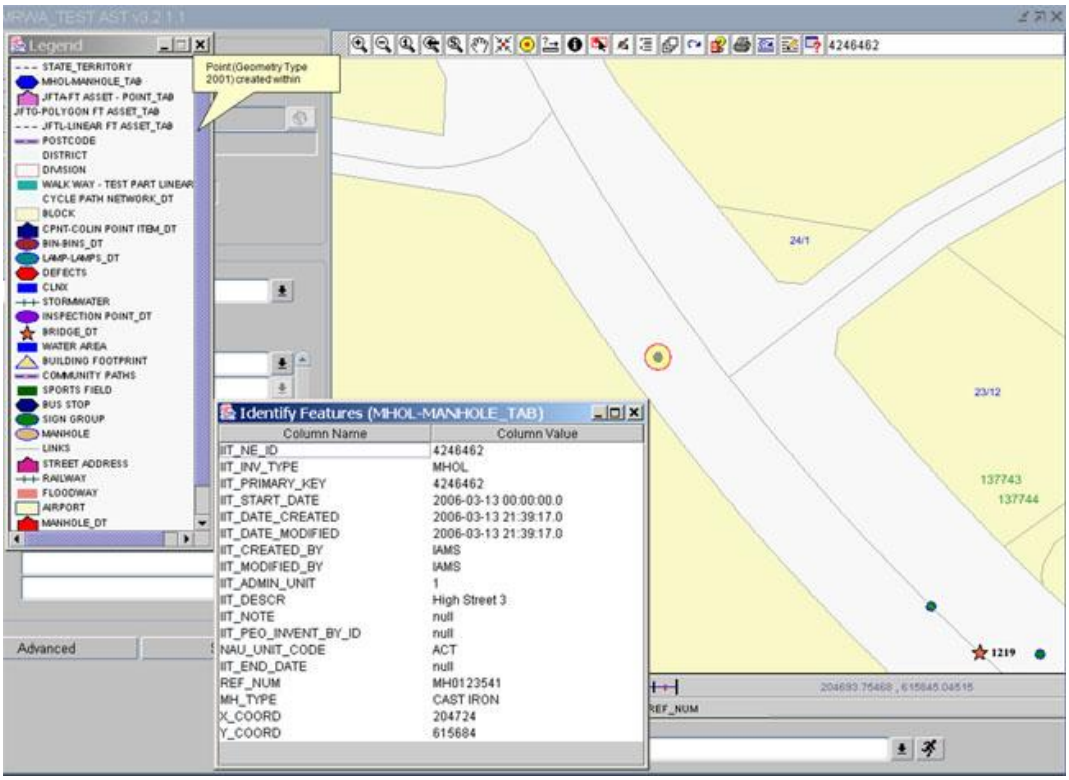

Figure 43

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2.3.20 Assets with defining XY coordinates that are Netcoded to Derive a Network Location

These are Asset Types that have a defining XY coordinate position (*i.e.*, the Asset Type is flagged as 'Use XY') and have an associated Network Type defined in the Network Tab.

Note: If Assets of this type are loaded using the CSV loaders for example, the spatial geometry for each Asset will be automatically created if the X and Y values are present. Each Asset will also be Netcoded during the loading process.

The IIT_X and IIT_Y columns must be defined as the columns used to store the X and Y coordinates respectively.

When the Spatial Layer for these Asset Types is created using the [Create Layer] button, spatial data will be created for Point Asset Types only, *i.e.*, no spatial data will be created for line or polygon Asset Types (this is determined by the Geometry Type defined for the GIS Theme, *e.g.*, 2002 – 2D Line or 2003 – 2D Polygon). The spatial geometry of point Assets is created based upon the values present in the IIT_X and IIT_Y attributes of each Asset.

Point Assets (Geometry Type 2002 – 2D Point) defined in this manner will be Netcoded when the Spatial Layer is created. This allows a Network Location to be derived from the XY coordinates of an Asset, by 'snapping' it to the nearest allowable Network Location.

Assets of this type may be created within both Spatial Manager and the forms Environment. The tables below show the expected behaviour for each type of Asset.

Environment	***Spatial Manager***		
Asset Type (Geometry Type)	***Create Asset and spatial geometry***	***Asset is Netcoded***	***IIT_X and IIT_Y attributes automatically updated***
Point (2001 – 2D Point)	Yes	Yes	Yes
Line (2002 – 2D Line)	Yes	No	No
Polygon (2003 – 2D Polygon	Yes	No	No

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Figure 44 shows an example of a Point Asset Type (Geometry Type 2001 – 2D Point) Off Network Asset that has been created within Spatial Manager. Note that the X and Y coordinates have been automatically populated and that the Asset has been Netcoded.

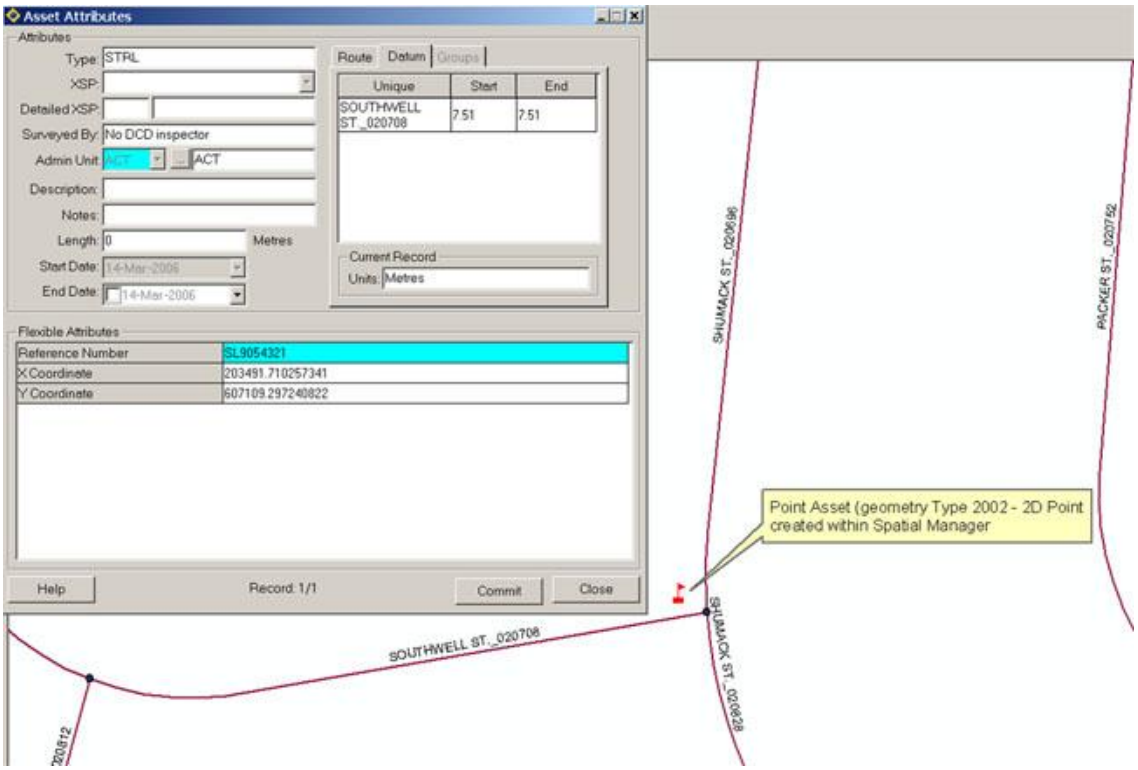

Figure 44

When creating these types of Assets within the Forms environment the spatial geometry is only created for Point assets (Geometry Type 2001). The shape is driven from the values entered into the IIT_X and IIT_Y attributes. Only Point Assets will be Netcoded.

Environment	***Forms***		
Asset Type (Geometry Type)	***Create Asset and spatial geometry***	***Asset is Netcoded***	***IIT_X and IIT_Y attributes automatically updated***
Point (2001 – 2D Point)	Yes	Yes	N/A
Line (2002 – 2D Line)	Yes	No	N/A
Polygon (2003 – 2D Polygon	Yes	No	N/A

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Figure 45 shows an example of a Point Asset Type (Geometry Type 2001 – 2D Point) Off Network Asset that has been created within the forms environment. The X and Y coordinates have been typed in by the User. The system will automatically create the spatial geometry thus allowing the Asset to be displayed spatially. It has also been Netcoded, with a network location being derived from the nearest allowable Network Type.

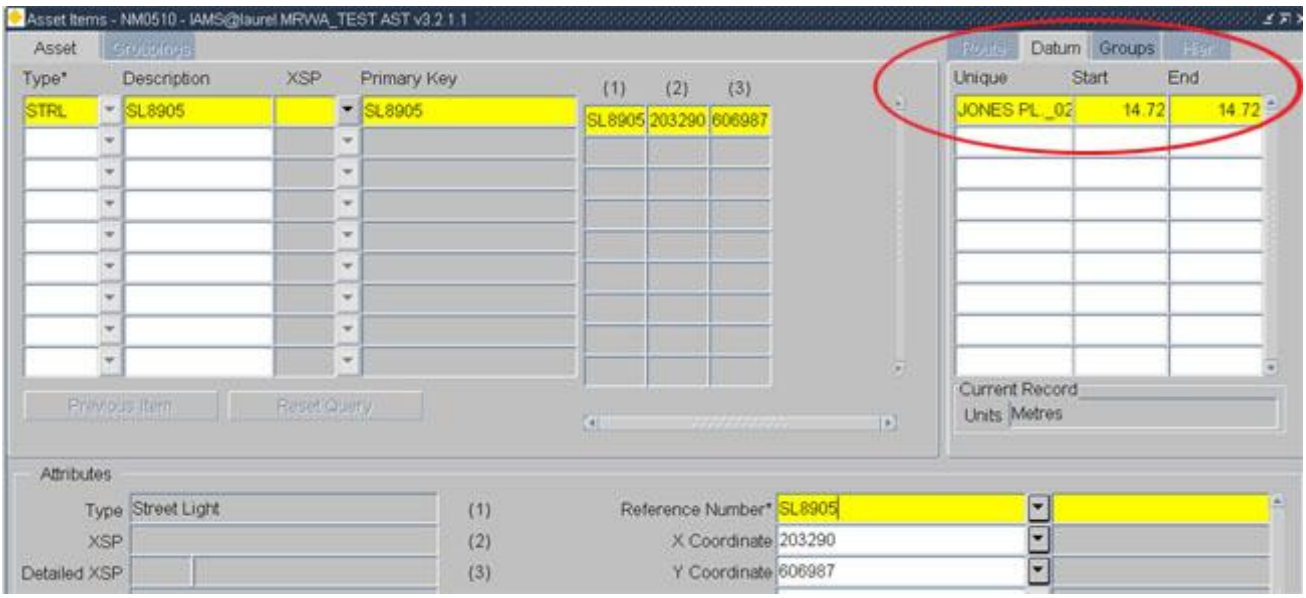

Figure 45

Figure 46 shows the same Asset within Spatial Manager.

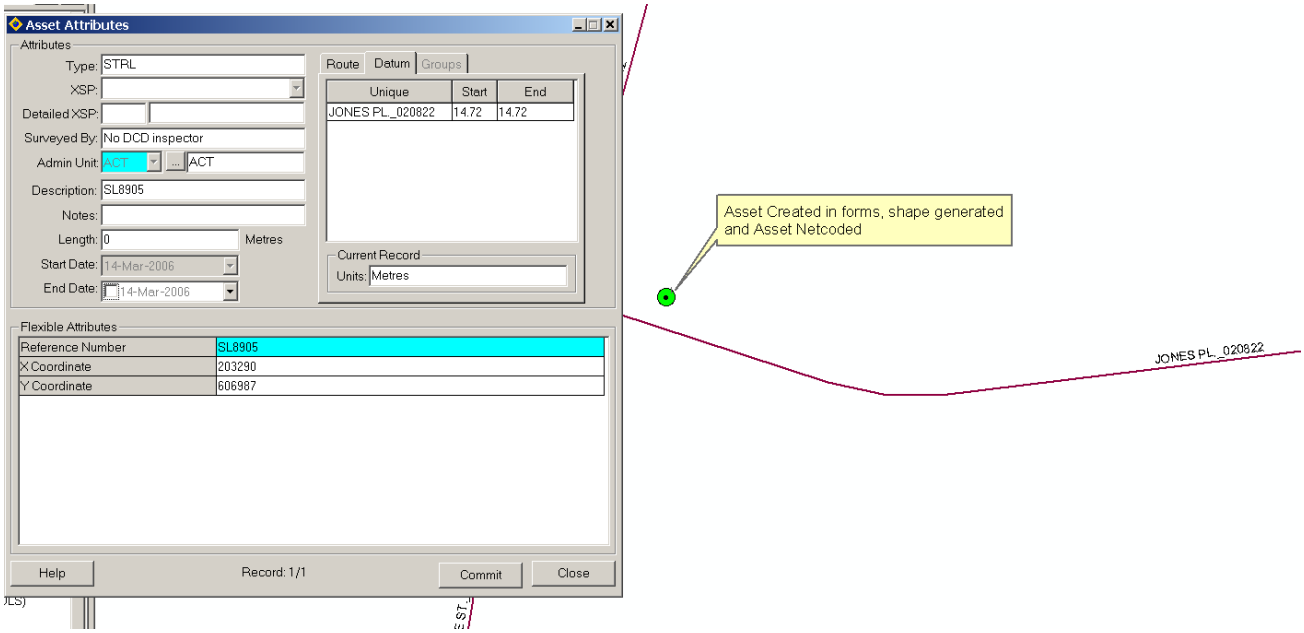

Figure 46

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2.3.21 Asset Metamodel For Alerts, Audit and Query Builder

Query Builder, Audits and Alert manager all rely on Asset Metamodel's when building queries or defining business rules for e-mail alerts or defining what data should be audited. The use of such Metamodel's allows the User Modules associated with these functional areas to use friendly attribute names as opposed to the underlying database column names.

Asset Metamodel's broadly fall into 3 categories, namely Standard Asset Models (whose Category is 'I'), Foreign Table (or External Asset) Models (whose Category is 'F') and models specifically defined for use with Query Builder, Audits and Alerts (Category is 'A'). The table below shows the category of Asset Type and the allowable use of these Types within Query Builder, Audit and Alert manager respectively

	Query Builder	***Audit***	***Alert***
Standard Asset Types (Category 'I')	Yes	No	No
Foreign Table Asset Types (Category 'F')	Yes	Yes (see notes below)	Yes (see notes below)
Audit and Alert Asset Types (category 'A')	Yes	Yes (see notes below)	Yes (see notes below)

Note:

Foreign Table (category 'F') and Audit / Alert Asset Types (category 'A') can only be used with Audit and Alert functionality if the Type has been defined against a Base Table as opposed to a database View.

Foreign Table (category 'F') and Audit / Alert Asset Types (category 'A') can NOT be used with Audit and Alert functionality if the Type has been defined against NM_ELEMENTS_ALL or NM_INV_ITEMS_ALL

2.3.22 Asset Type Definition

The method of defining an Asset Type for use with the Audit or Alert functionality is the same as for defining a standard Asset Type. There are however a number of key points to note when defining such Asset Types.

2.3.22.1 Asset Type Tab

Point / Continuous Flag This flag is not important for these Asset Types. For consistency we recommend that Asset Types used for Audit / Alert purposes are defined as 'Point'.

Category The Category must be defined as 'A' – Alert and Audit Metamodel's

Admin Type A default Admin Type of EXT$ is shipped for use with 'Category A' Asset Types. This Admin Type has no associated Admin Units and none should be defined. A different Admin Type may be defined as an alternative to the default if required, however no Admin Units for the Type need to be defined.

2.3.22.2 Foreign Table Panel

Table Name This must be the database table that stores the data in question and cannot be a database view. Additionally the database table must be one which has a defined Primary Key for use in the 'Primary Key Column' attribute.

Note: The Column defined as the Primary Key Column must also be defined as an Attribute of the Asset Type within the Attributes Tab.

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LR NE Column Name, **LR Start Chain**, **LR End Chain**

These attributes do not require values for Asset Types defined purely for use with Audit and / or Alert functionality, *i.e.*, those of Category 'A'. If a Foreign Table Asset Type is used for this purpose these values should be populated as required.

2.3.22.3 Attributes Tab

Since no Asset Data Items are being created no validation is required such as Min or Max values. However, a List of Values for specific attributes can be defined to decode values into meaningful text. When used within the body of an e-mail Alert these decoded values are used in place of the actual database value. Lists of Values are defined using 2 distinct methods, namely a Domain Lookup or a Query Lookup.

Domain To define a fixed list of values for an Attribute use the Asset Domains – NM0301 module as for a standard Asset Type.

Query This is not available for use

View Attribute, **Column Name**

The 'View Attribute' and' Column Name' fields are mandatory fields within the Asset Metamodel – NM0410 module but are not used within this Asset Category. Any valid values can be entered.

Attribute Flags The 'Displayable' flag is the only flag used for this Asset Category. It is used with the Navigator Results panel to determine which attributes are displayed.

2.3.22.4 Networks Tab

The definition of a network Type is not required for this Asset Category.

2.3.22.5 Roles Tab

Standard Role based security is imposed on these Asset Types. If a User has not been granted an appropriate Role for an Asset Type, they will not be able to use that Asset Type to define Audit or Alert business rules. The Asset Type will also not be available within Query Builder.

2.3.22.6 Groupings Tab

The definition of asset grouping is not required for this Asset Category.

2.3.23 Standard Audit/Alert Asset Metamodel's

The following Asset Metamodel's of Category 'A' – Alert and Audit are shipped as default

- WOR$ - Works Order
- WOL$ - Work Order Line
- DEF$ - Defects
- BOQ$ - BOQ Items
- ENQ$ - Enquiry
- PRO$ - Process Alert (This is for sending out Alert for Process initiated from framework)

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2.4 Foreign Tables

Data held in 3rd Party systems may be interfaced with Exor using various methods such as calls to an Application Programme Interface (API), a bespoke interface or Exor Foreign Tables. In many cases the interface may a combination of these methods.

A 'Foreign Table' is the term given to an Asset Type Metamodel which access's data held in a 3rd Party application and not data which is held within the Exor Database. The 3rd Party application may be another Oracle Database or any other Application that Oracle can access though such means as an ODBC link.

'Foreign Data' may be integrated with other data held within Exor or even data held in another 3rd Party system, with the Exor system acting as a central Hub. This allows data held in many different systems to be interrogated and used in complex queries using tools such as Merge Queries or PBI and allows for a single view of the data to be displayed in tools such as Assets on a Route. 'Foreign Data' may also be displayed spatially using Spatial Manager by Exor or Exor Map Server. Figure 47 shows a possible example of 4 3rd Party systems being interfaced with Exor using Foreign Table functionality. This would allow any of the 'Foreign Data' to be integrated with any other data via the 'hub' provided by Exor be Exor. For example Accident and Traffic Volume data could be integrated to calculate the MVKm (Million Vehicle Kilometre) statistic for a given extent of Road or an abnormal load may be routed using the Bridge height and weight restrictions from the external bridge system and the Road information held within Exor.

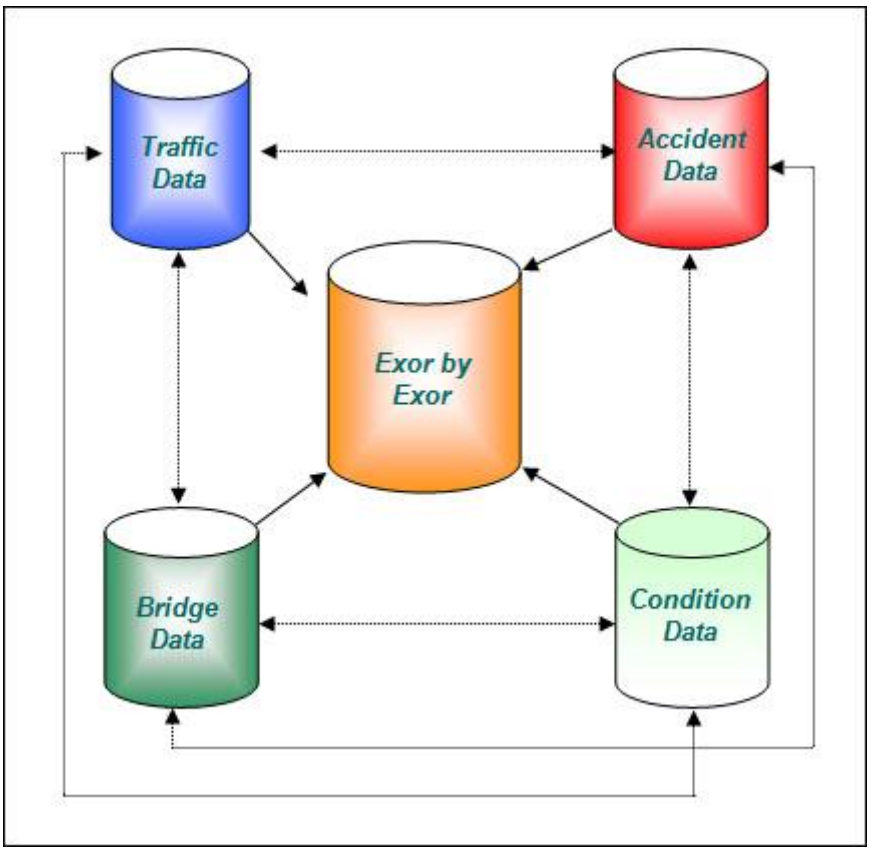

Figure 47 – Example Foreign Table Data Types

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'Foreign Data' interfacing with Exor using the Foreign Table functionality available within Asset Manager, is dependant upon the location of the Foreign Data being referenced against one of the Linear Referencing Methods (LRM) defined within the Network Metamodel of Exor, *i.e.*, the Foreign Data must have a inherent Route and Offset value for each data item. For example, an LRM of Classified Roads may have been defined within Exor. This in reality is a Group of connected Datum Elements that Network Manager uses to calculate Route Offsets. Each item of 'Foreign Data' must have a reference to the Classified Road (the Route reference should equate to the NE_UNIQUE of the Linear Group) and the Start and End offsets relative to the Route on which the item is located.

The 'Foreign Data' is interfaced with Exor via the use of a Database View which 'translates' the externally held Route and Offset information for each data item into the a location relative to each of the Datum Elements, modelled within Network Manager, on which the data item resides. This Database View is then used as the 'Foreign Table' when defining the Foreign Table Asset Type.

The disadvantage of using Foreign Tables as an integration method is that it they rely on each Foreign Data item having the correct relative Route Offset and that Route offset exists within Network Manager. When Network Edits such as Split and Merge are conducted, they should not have any affect on the relative Route Offsets of the Routes of which the affected Datum Elements are members and thus the 'Foreign Table' Route and Offsets are unchanged. However, if the Route is shortened or lengthened through the closure, addition or recalibration of any member Datum Elements, the relative Route position of any Foreign Data items may have been affected. These changes will not be automatically reflected in the Foreign Data, therefore affecting the integrity of the 'integrated data'. The Foreign Data must therefore be updated outside of Exor.

One option to resolve this problem (or indeed if no relative Route references exist within the Foreign Data) is to use a combination of API calls and Foreign Table functionality. This method would create a 'placeholder' asset within Exor using an API function call with a foreign key to the Foreign Data item. No other attribute information would be defined within Exor. When a new Foreign Data item is created the Route and Offset measures would be passed in via the 3rd Party system (possibly as attribute data). An API call would create a new item along with the 'Foreign Key' to the item. The Asset API calls would handle all data integrity issues in relation to the existence of the Route location etc. If the relative Route location of an item was amended through a Network Operation the new Route and offset values would be extracted using another API call available within the Published API's.

Note: This approach would need an API call from the external system to 'read in' the new location details of an item.

API calls are already available to handle the closure (end dating) etc of data items in 3rd Party Systems. In this scenario Network Manager could be seen as the 'linear referencing engine'.

To fully integrate the 3rd Party system with other 3rd party systems or other data held within Exor a Database view would be created which would join the Foreign Data items with the 'surrogate' item held within Exor, using the Foreign Key. This Database View would contain the location of the item, held within Exor, and the Attribute information, held within the 3rd Party system. This View would then be used when defining a Foreign Table asset type as described earlier.

The benefit of this approach is that the location (and hence data integrity) of a data item is handled entirely within Network Manager and therefore eliminates the need for data remediation when Route Offsets are altered, although is more complex in its approach due to the use of API function calls.

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2.5 Asset Exclusive View Creation - NM0411

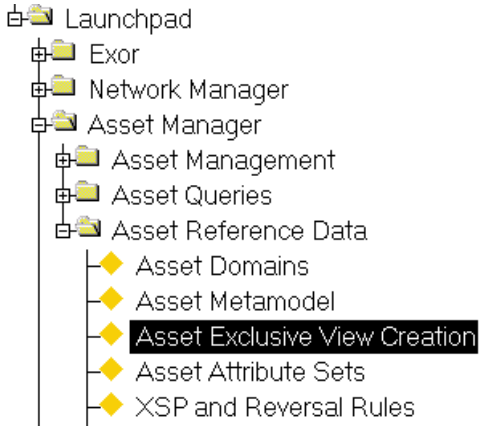

Figure 48 - Exclusive View Creation Menu Option

This module is used to create a new 'Foreign Table Asset Type' for exclusive Asset Types where exclusivity is applied by virtue of a Cross Sectional Position (XSP) and/or an 'Exclusive Attribute' (see page 28 for more information of Exclusivity). These Asset Types will have a category of 'X' - Generated Exclusive Asset Type.

These Exclusive Foreign Table Asset Types may be used when querying or reporting on data using tools such as Engineering Dynamic Segmentation, Merge or PBI Queries (see Asset User Manual) where only an exclusive set of data is required to be included. For example, an Asset Type of 'RUFF - Roughness' may exists which is exclusive by virtue of XSP and an Attribute of 'Year', *i.e.*, many roughness Items may exist at the same linear offset within the same XSP but each Item must have a different value for the 'Year' attribute. An Engineering Dynamic Segmentation analysis is required on the Roughness data, but only for the Year 2000 data. To facilitate this an 'Exclusive Foreign Table Asset Type' would be created which would 'filter out' unwanted data. Another example would be if an Engineering Dynamic Segmentation analysis were to be conducted on Road Construction Data (Structural Projects Manager) but only for a specific Construction layer.

The Exclusive Foreign Table Asset Types utilise a Database View or Snapshot (also called a Materialised View) of the required data created dynamically via this module. A View or Snapshot (and associated Foreign Table Asset Type) will be created for each possible combination of Exclusive Attributes and XSP's if applicable based upon existing Asset Item data. Therefore, using the example of 'Roughness' above, a new 'Exclusive Foreign Table Asset Type' must be created for each new Annual survey for each of the required XSP's if appropriate.

For example, the Asset Type 'RUFF - Roughness' has allowable XSP's of L, L1, R and R1 and has an Exclusive Attribute of 'Year'. Data exists for each XSP for Years 2000 and 2001. The possible combinations that would be derived for the RUFF Asset Type are

- RUFF - L - 2000
- RUFF - L1 - 2000
- RUFF - R - 2000
- RUFF - R1 - 2000
- RUFF - L - 2001
- RUFF - L1 - 2001
- RUFF - R - 2001
- RUFF - R1 - 2001

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Using a Snapshot instead of a Database View may significantly improve the performance of any queries using the Snapshot, but it must be noted that the Snapshot is a 'copy' of the data at the time the Snapshot is created and will be 'invalid' if any of the data is affected by a Network Operation, *e.g.*, Split, Close, etc. The Snapshot is however, configured to be refreshed every 7 days at midnight, or as soon after when the Database is available. This refresh period may be amended if required by your System DBA.

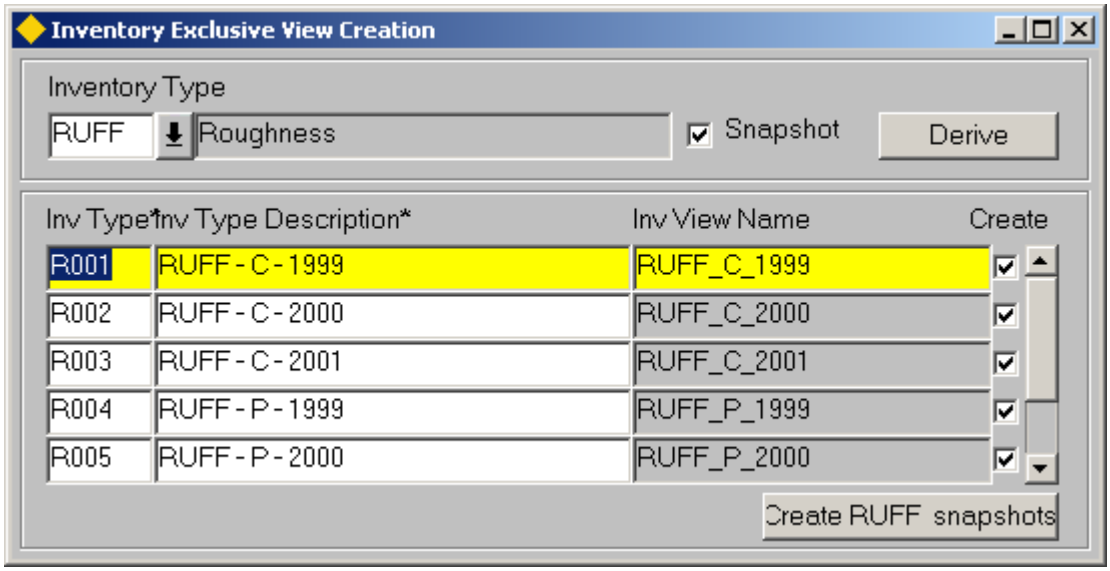

Figure 49 – Inventory Exclusive View Creation

Asset Type *(Required)* *List*

Select the Asset Type for which to create 'Exclusive Asset View or Snapshot' and 'Foreign Table Asset Type'. The list of values will contain only those Asset Types that are flagged as 'Exclusive' which are also flagged as 'XSP Allowed' and/or have an Exclusive Attribute.

The Asset Type description will be displayed in the adjacent field.

To generate a list of the possible Combinations of Exclusive Attributes and/or XSP values, press the [Derive] button on the form.

Snapshot *(Checkbox)*

If Snapshots are to be created select this box before pressing the [Derive] button.

To generate the list of 'Exclusive Asset Types' press the [Derive] button.

Inv Type *(Required, Default)*

The Asset Type code will be system generated and adopts the first character of the selected Asset Type, *e.g.*, 'R', and suffixes this with a three-digit number from a sequence, resulting in a Foreign Table Asset Type of 'R001' for example. If a subsequent Asset Type that also began with the letter ‘R’ was used the sequence would continue, otherwise it is 'reset' and would begin again at 001. This Asset Type code may be amended if required.

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Inv Type Description *(Required, Default)*

The Description of the 'Foreign Table Asset Type' will be generated using the following naming convention:

<Asset Type Code>_<XSP>_<exclusive attribute value>

For example, **RUFF_L1_2000**. This Asset Type description may be amended if required.

Inv View Name *(Display Only)*

The name of the Database View or Snapshot if applicable to be created will be displayed.

Create *(Checkbox)*

Select this option if a Foreign Table Asset Type is to be created for this Exclusive combination. The checkbox is selected by default.

To Create the Database views and Foreign Table Asset Types press the [Create RUFF Snapshots] button on the form. A message will be displayed once the operation is complete.

Figure 50 shows an example of a generated Exclusive Asset Type.

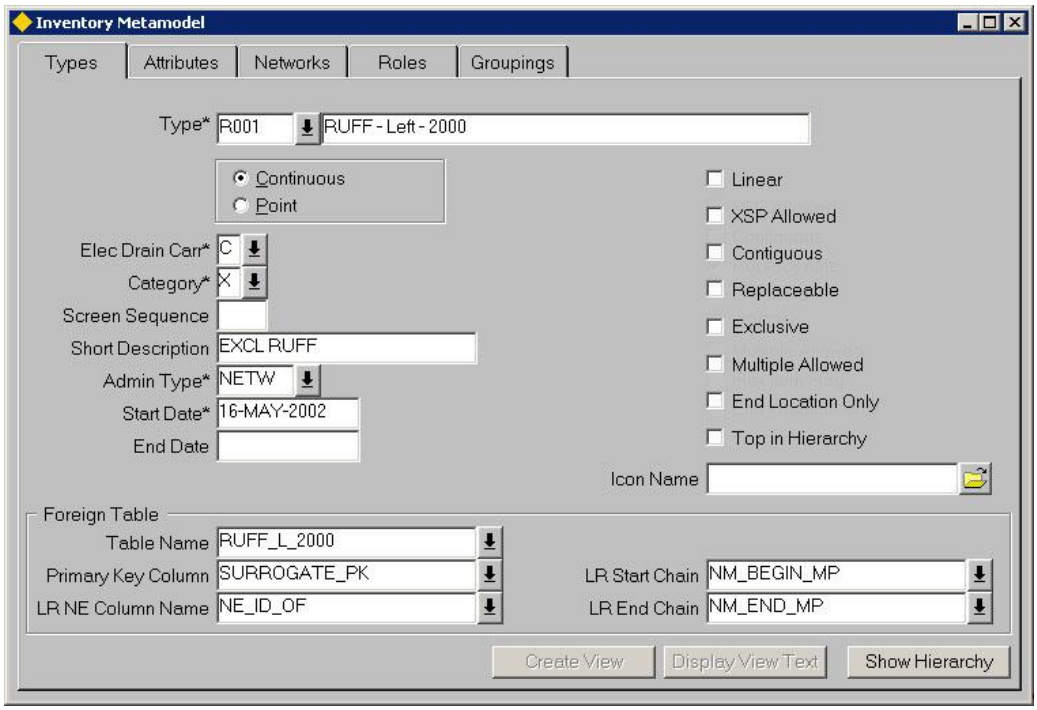

Figure 50 – Exclusive Asset Type Created

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2.6 Asset Attribute Sets - NM0415

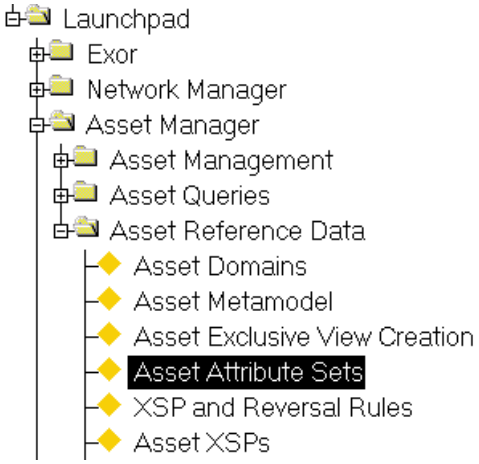

Figure 51 - Asset Attribute Sets Menu Option

Asset Attribute Sets are User defined filters allowing the display of relevant Asset Item Attributes to suit your operational requirements. They are used in modules such as Assets on a Route - NM0560 and some Asset related reports. When an Asset Attribute Set is applied only the Attributes within the set are displayed.

Attribute Sets may also be created from the Item Types and Attributes defined in PBI queries. Refer to the Asset Manager User Guide for more information.

An Asset Attribute Set may contain many different Asset types with as many of the Asset Attributes as needed.

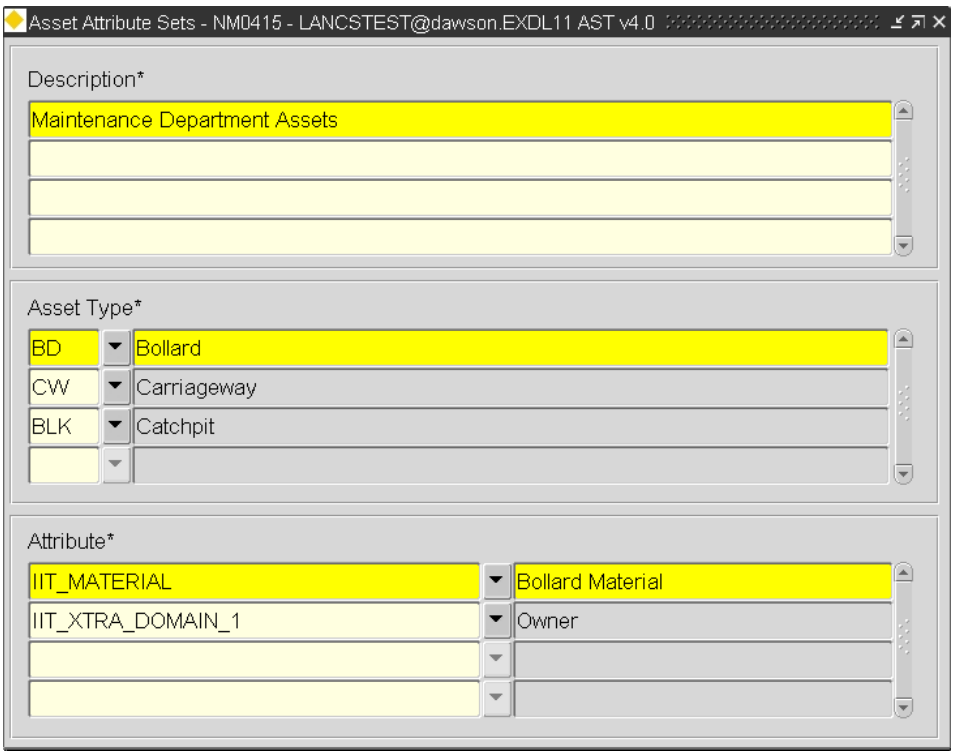

Figure 52 – Asset Attribute Sets

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Description ***(Required)***

Enter a Description for the Attribute Set. A maximum of 80 characters is allowed.

Asset Type ***(Required)*** ***List***

Enter the required Asset Type. The list of available Asset Types will be restricted to those Asset Types to which the User has Role based access. The Asset Type Description will be displayed in the adjacent field.

Attribute ***(Required)*** ***List***

Select the Attribute to display as part of the Set. To add another attribute of the same Asset Type press the [Create Record] button on the menu toolbar or click in the next available row.

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2.7 XSP and Reversal Rules – NM0305

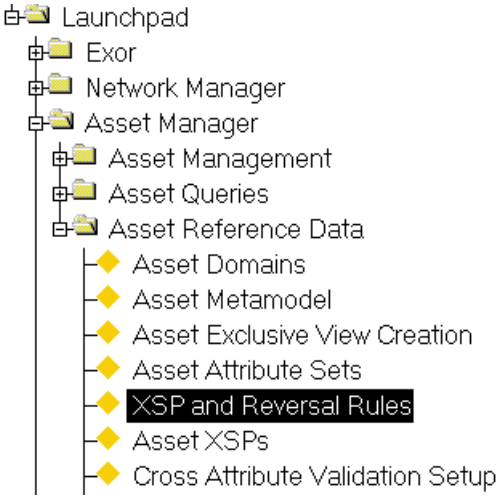

Figure 53 - XSP and Reversal Rules menu Option

This form is used to manage the valid XSP's (cross sectional positions) for a Network Type Subclass and to specify the Asset Types, which may be located at a given XSP. An appropriate XSP description for each Asset Type may be added using Asset XSP's - NM0306.

The rules governing the XSP of objects located on a Network and their subsequent XSP should the Route on which they are located be 'Reversed' are also defined using this form.

An XSP is a means of identifying a transverse location on a section of Network.

Consider the example below:

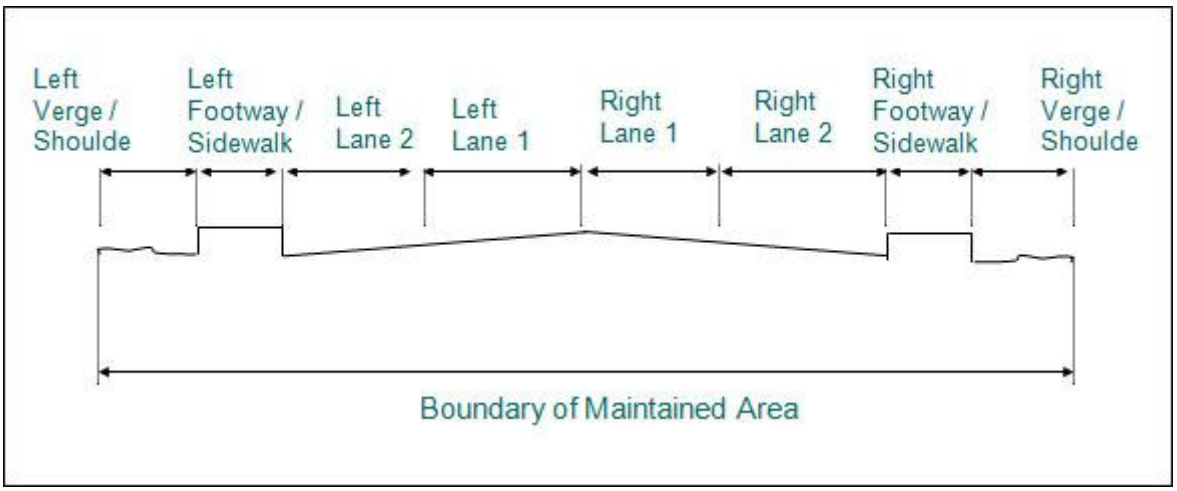

Figure 54 - Example of XSP's

Figure 54 shows an example cross-section of a portion of road. XSP values have been defined to provide a referencing method for transverse location. The valid XSP's for this portion of the Network would be 'Left Verge/ Shoulder', 'Left Footway / Sidewalk', 'Lane 1', 'Lane 2', 'Lane 3', 'Lane 4', 'Right Footway / Sidewalk' and 'Right Verge/ Shoulder'. The XSP's can be defined to suit your operational and Organisational requirements and may be as simple as 'Left of Centre', 'Centre' and 'Right of Centre'.

A set of XSP values may be associated with each Network Sub Class.

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To provide a means of validating the transverse location of an Asset Item, Asset Item Types may be associated with particular XSP's within a Network Sub Class. For example, a bus shelter would normally be positioned on the left or right verge or shoulder and would not be in any XSP's relating to the actual 'Running Surface' of the road. If an Asset Item Type is to have an associated XSP the 'XSP Allowed' flag must be checked for the Asset Type in Asset Types- NM0410.

If an Asset Item Type may be located on multiple Networks Types or multiple Sub Classes within a Network Type, its valid XSP's must de defined for each combination of Network Type and Sub Class.

The values entered in this form will be used when validating both manual and bulk Asset Item loading.

2.7.1 XSP and Reversal Rules

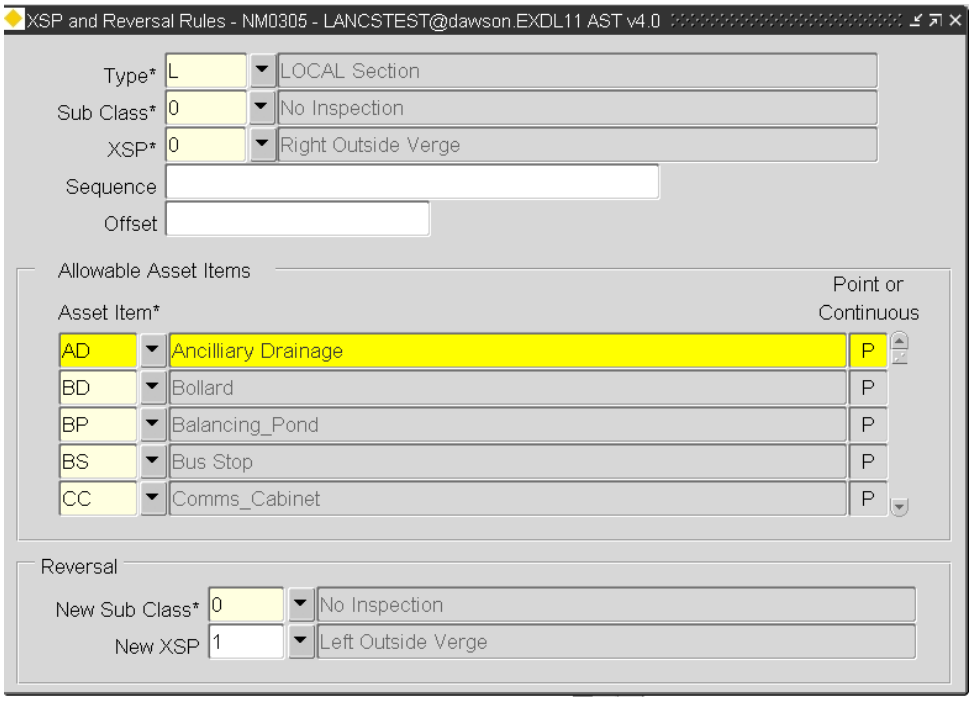

Figure 55 - XSP and Reversal Rules

When you enter this window the cursor sits in the 'Type' field waiting for a new combination of Network Type/Sub Class and XSP to be entered or an existing combination to be queried back. To query back an existing XSP combination press the [Enter Query] button on the menu toolbar (or press F7), enter some selection criteria, then press the [Execute Query] button (or press F8).

Type ***(Required)*** ***(List)***

Select the Network Type to which the XSP will be associated. Only those Network Types flagged as being of type 'Datum' and/or 'Linear' using Network Types - NM0002 are selectable. The Network Type description will be displayed in the adjacent field.

Sub Class ***(Required)*** ***(List)***

Enter the Network Type Sub Class to which the XSP will be associated. The Sub Class must be valid for the Network Type selected in the previous field and will already have been defined in the 'Sub Class' window of Network Types - NM0002. The Sub Class description will be displayed in the adjacent field.

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XSP ***(Required)*** ***(List)***

Enter a code for the XSP. A maximum of 4 characters is allowed.

Enter a default description for the XSP in the adjacent field. The default XSP description can be replaced with a specific description for the Asset Type using Asset XSP's – NM0306. For example, a valid XSP for a Network Type / Subclass may be defined as 'L - Left'. If an Asset Type of PASH – Pavement Shoulder, has a valid XSP of 'L,' the default XSP description (LEFT in this case) may be replaced with a more appropriate description for the Asset Type, *e.g.*, LEFT SHOULDER. This description will be displayed on Asset Items - NM0510 if a Pavement Shoulder Asset Type is added with an XSP of 'L'.

Sequence ***(Optional)***

Enter a sequence number that will order this XSP in relation to other XSP's for this Network Type / Sub Class combination.

Offset ***(Optional)***

Enter the Offset value used to represent the XSP in a spatial representation. Offset values are measured in meters and represent a lateral distance from the centreline of the Datum Network. The Offset value is measured relative to the network cardinality, *i.e.*, XSP's to the left of the network cardinality will have a negative Offset, XSP's to the right of the network cardinality will have a positive Offset.

2.7.2 Allowable Asset Items

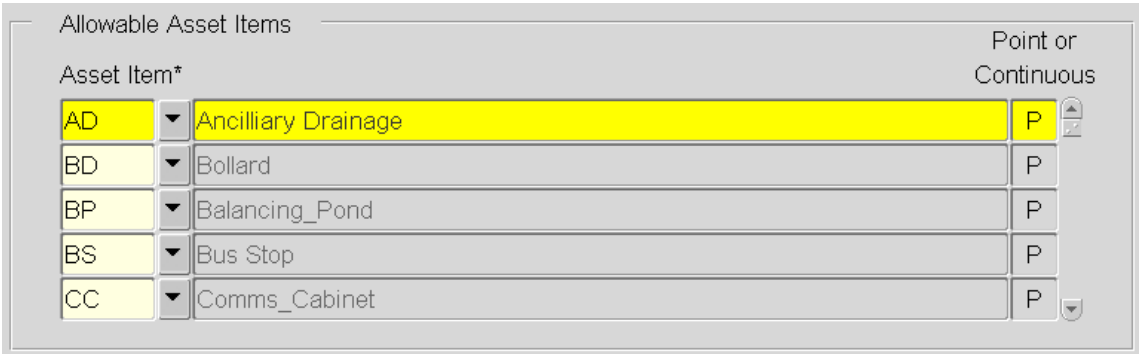

Figure 56 - Allowable Asset Types

This panel is used to specify the Asset Types, which may be located at a given XSP / Network Type / Sub Class combination. An Asset Type may be associated with more than XSP / Network Type / Sub Class combination.

To add an Asset Type to the Allowable Asset Items, press the [Create Record] button on the menu toolbar (or press F6).

Asset Item ***(Required)*** ***(List)***

Enter the Asset Type code to which the selected XSP / Network Type / Sub Class combination may apply. These Asset Types will have already been defined using Asset Types - NM041.

The Asset Type description and the 'Point' or 'Continuous' flag will be displayed in the adjoining fields.

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2.7.1 **Reversal**

Figure 57 - XSP Reversal

This panel is used to define the rules for the transverse location of an object if the measuring system used for the Route is reversed. If a Route is reversed *i.e.*, the Start Node becomes the End Node, the referencing of all data will be measured from the opposite end of the Route and the XSP of an object may also have to be 'transposed'. If the Route to be reversed is a Dual Carriageway / Divided Highway the Network Sub Class may also need to be reversed, *i.e.*, the Left Indicator become the Right Indicator.

New Sub Class ***(Required)*** ***(List)***

Enter the New Sub Class for the XSP.

Note: These Sub Classes will have been previously set-up for the selected Network Type using Network Types - NM0002.

New XSP ***(Optional)*** ***(List)***

Enter the new XSP for the reversal.

A Route may be reversed using the [Reverse] Reverse Button on the Floating Toolbar in form Groups of Sections – NM0110.

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2.8 Asset XSP's - NM0306

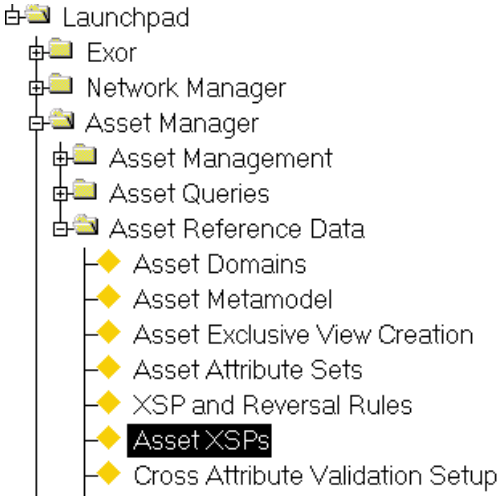

Figure 58 - Asset XSP's Menu Option

This form is used to define XSP Descriptions appropriate to specific Asset Types. These Descriptions will be displayed against an Asset Item of the selected Type in place of the default XSP description in Asset Items - NM050.

For example, an Asset Type of PASH - Pavement Shoulder, has a valid Network Type / Subclass XSP of 'L' - Left, the XSP description for this XSP combination may be defined as Left Shoulder, thereby giving a more descriptive name to the XSP for the Asset Type.

Valid Network Type/Subclass/XSP combinations are defined for Asset Types using Asset XSP and Reversal Rules - NM0305.

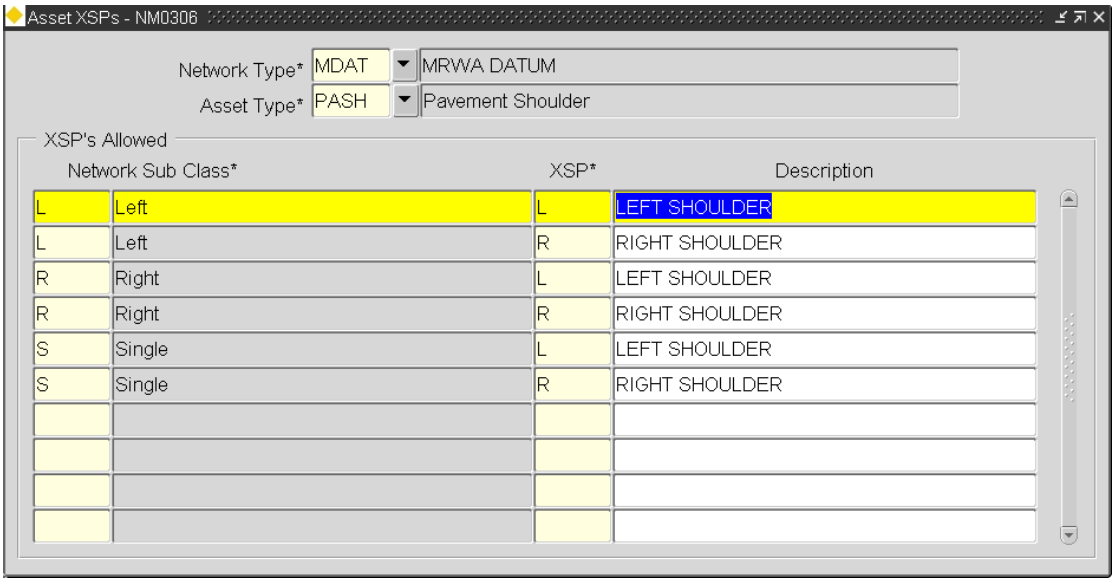
Asset XSPs - NM0306
Network Type* MDAT MRWA DATUM
Asset Type* PASH Pavement Shoulder
XSP's Allowed
Network Sub Class* XSP* Description
L Left L LEFT SHOULDER
L Left R RIGHT SHOULDER
R Right L LEFT SHOULDER
R Right R RIGHT SHOULDER
S Single L LEFT SHOULDER
S Single R RIGHT SHOULDER

Figure 59 - Asset XSP's

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When you enter this form the cursor sits in the 'Network Type' field waiting for a valid Network Type and Asset Type combination to be entered. When these fields have been entered click in the 'XSP's Allowed' area of the form to view the valid Network Type / Subclass / XSP combinations for the selected Asset Type.

Network Type ***(Required)*** ***(List)***

Enter the Network Type on which the required Asset Type may be located.

Asset Type ***(Required)*** ***(List)***

Enter the Asset Type that the Description is to be added for.

To view the valid Network Type Subclass/XSP combinations for the selected Network/Asset Type, click in the XSP's allowed area of the form.

2.8.1 XSP's Allowed

XSP's Allowed

Network Sub Class*		XSP*	Description
L	Left	L	LEFT SHOULDER
L	Left	R	RIGHT SHOULDER
R	Right	L	LEFT SHOULDER
R	Right	R	RIGHT SHOULDER
S	Single	L	LEFT SHOULDER
S	Single	R	RIGHT SHOULDER

Figure 60 - XSP's Allowed

The Network Type Subclass/XSP combinations for the selected Network/Asset Type will be displayed.

Description ***(Optional)***

Enter a description for the Network Sub Class / XSP combination, relevant to the selected Network/Asset Type. A maximum of 80 characters is allowed.

Note: The descriptions entered here will be displayed on the Asset Items - NM0510 form for Asset Item of the Selected Type.

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2.9 Cross Attribute Validation Setup– NM0550

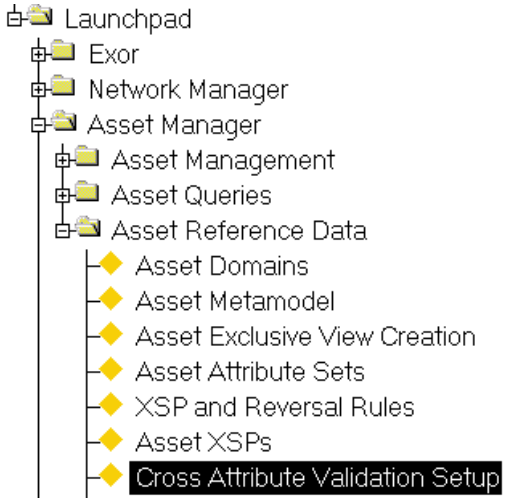

Figure 61 - XAV Menu Option

This module is used to maintain the Rule Sets used to validate the value entered for an Attribute against the value(s) entered for another. This is known as Cross Attribute Validation.

If during the entry or update of Asset Items an Attribute fails a Cross Attribute Validation check the associated error message will be displayed when the User attempts to save the record. An example is shown in Figure 62.

.

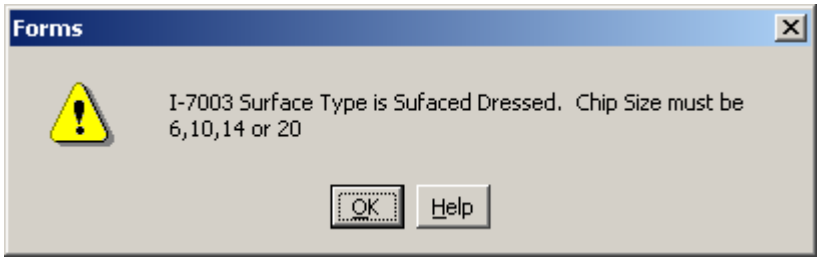

Figure 62 – Error Message

Note: The record will not be saved if any of the Item Attributes fail a Cross Attribute Validation check.

A single Attribute may have more than 1 Cross Attribute Validation Rule associated with it.

The metadata definition of a Cross Attribute Validation rule is divided into 3 main component parts. These are:

- a set of Conditions
- an Error message
- the Rule which associates the Error to a set of conditions

A Cross Attribute Validation Rule contains a set of 'Driving' conditions and a set of 'Validation' conditions both of which may contain 1 or more previously defined conditions with a Boolean Connector (AND or OR).

When the System checks the validity of the data entered for an Item Attribute which has had a Cross Attribute Validation rule defined, a check is first made that the 'Driving' conditions are met, *i.e.*, the 'Driving' conditions are true for the attribute value entered.

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If the ‘Driving’ conditions are satisfied a check is then made on the ‘Validation’ conditions. If these conditions are also satisfied, the specified Error Message will be displayed to the User an example of which may be seen in Figure 62.

Consider an example.

An Asset Item of Carriageway (CWAY) has 2 attributes, namely ‘Construction Date’ and ‘Material’. A business rule exists that specifies that if the Construction Date for an item of Carriageway precedes 01-Jan-1995, then the Material may not be Porous Asphalt (which has a value of ‘4’ in the associated Asset Domain).

The condition sets may look like this:

Driving Condition
CWAY.CWAY_DATE < '01-JAN-1995'
Validation Condition
CWAY.CWAY_MATERIAL = '4’

Where multiple conditions are used in either the ‘Driving’ or ‘Validation’ condition sets the relationship between the conditions may be set by selecting the appropriate Boolean Connector (AND or OR) from the available list.

Conditions are defined in the ‘Conditions’ panel of the module. A single condition may be used in multiple Rule sets.

When defining a new Rule set the Conditions’ and ‘Error Messages’ should be defined before the Rule.

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2.9.1 Worked Example

This section provides a worked example of how Cross Attribute Validation Rules may be applied to an Asset Item. The Item Type used is 'Carriageway' (Item Code CWAY) and has 7 associated Attributes as shown in the table below.

Table 6

Attribute Name	*Column*	*View Column Name*	*Domain Values*
Width	IIT_NUM_ATTRIB100	CWAY_WIDTH	
Surface Type	IIT_CHR_ATTRIB27	CWAY_MATERIAL	Asphalt Bitmac Concrete Porous Asphalt Surface Dressing
No of Lanes	IIT_NUM_ATTRIB101	CWAY_LANES	
Surface Date	IIT_DATE_ATTRIB90	CWAY_DATE	
Chip Size	IIT_NUM_ATTRIB100	CWAY_SIZE	
Date Last Inspected	IIT_DATE_ATTRIB86	DATE_INSP	
Date Next Inspection	IIT_DATE_ATTRIB88	NEXT_INSPECTED	

There are 4 business Rules that apply to an Item of Carriageway.

Rule 1 If the Carriageway Width is less than 6m then no more than 2 Lanes can exist.

Rule 2 If the Surface Date precedes 01-Jan-1995 then the Surface Date cannot be Porous Asphalt (4)

Rule 3 If the Surface Type is Surface Dressing (5) then the Chip Size must be entered and must be either a value of 6, 10, 14, 20.

Rule 4 If the Surface Type is not Surface Dressing then the Chip Size must not be entered.

Rule 5 The Date of the Next Inspection must be greater than the Date Last Inspected. Note that this is an example of XAV on a variable value.

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2.9.2 **Rule 1**

Rule 1 states that "If the Carriageway Width is less than 6m then no more than 2 Lanes can exist". Figure 63 Figure 65 show the metadata definition for Rule 1.

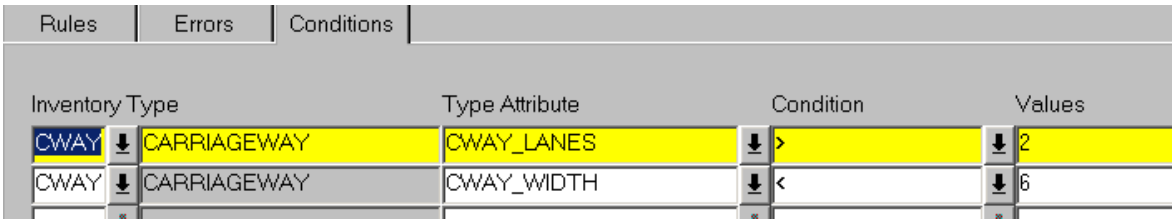

Figure 63 - Conditions

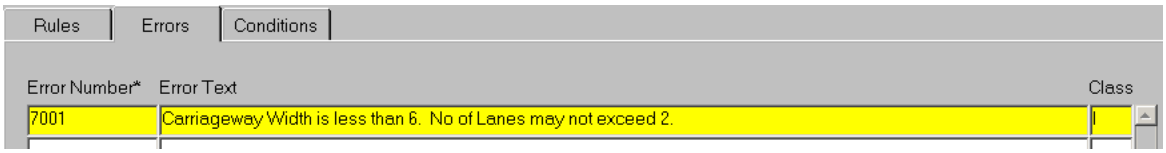

Figure 64 - Error message

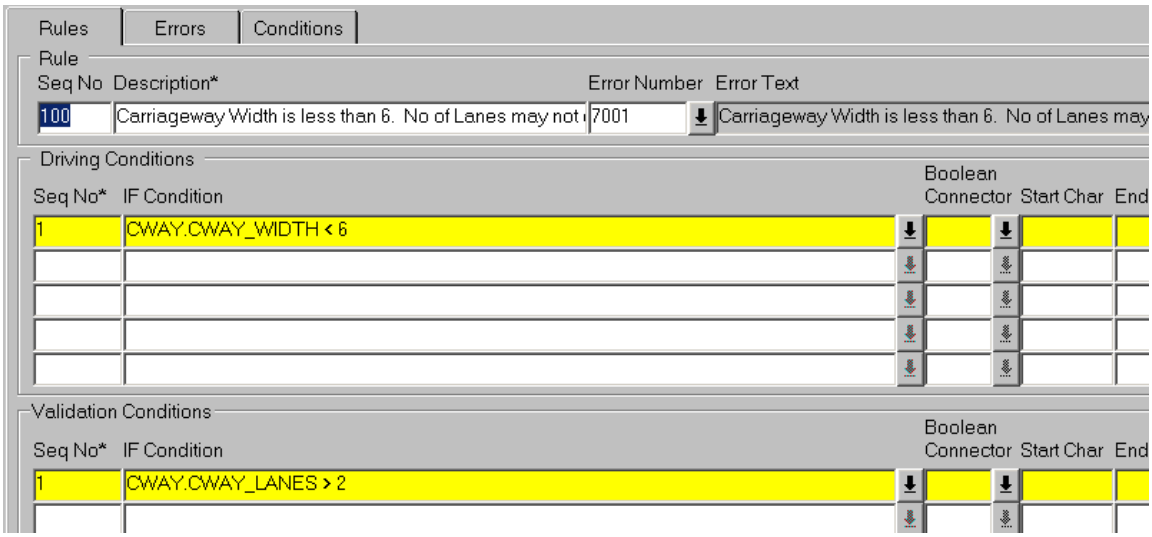

Figure 65 - Rule 1

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2.9.3 **Rule 2**

Rule 2 states that "If the Surface Date precedes 01-Jan-1995 then the Surface Date cannot be Porous Asphalt (4)".
Figure 66 to Figure 68 show the metadata definition for Rule 2.

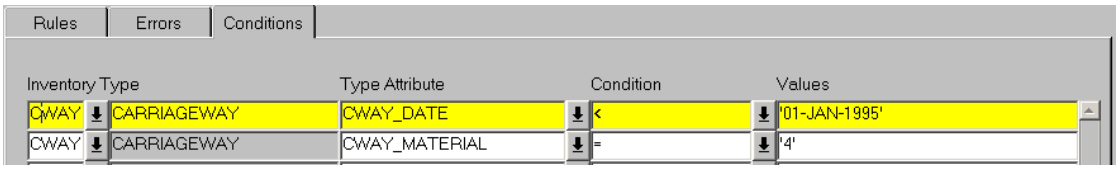

Figure 66 – Conditions

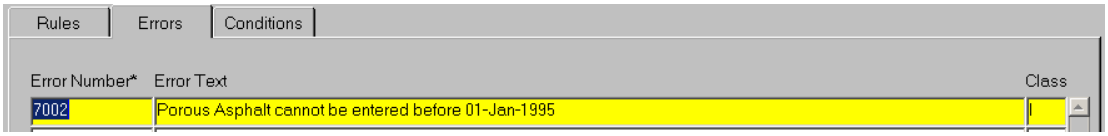

Figure 67 - Error message

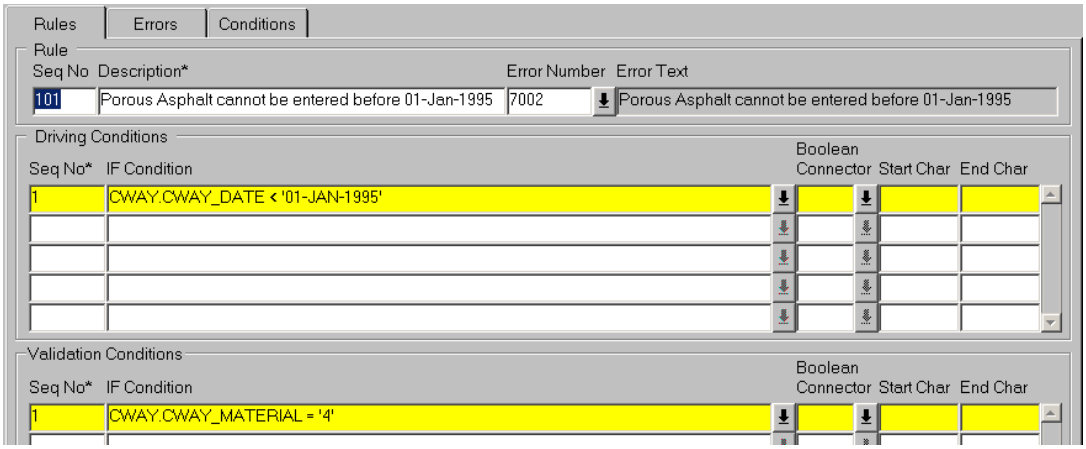

Figure 68 - Rule 2

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2.9.4 **Rule 3**

Rule 3 states that "If the Surface Type is Surface Dressing (5) then the Chip Size must be entered and must be either a value of 6, 10, 14, 20."

Figure 69 to Figure 71 show the metadata definition for Rule 3.

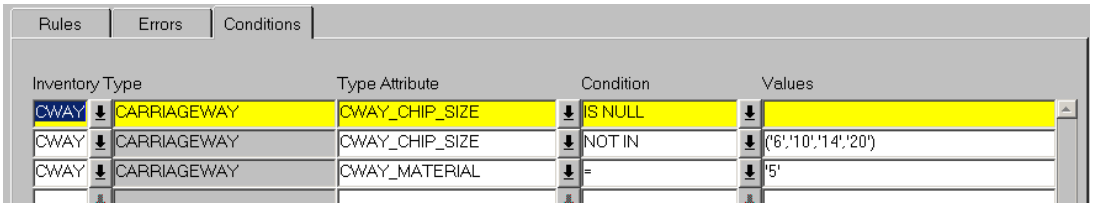

Figure 69 – Conditions

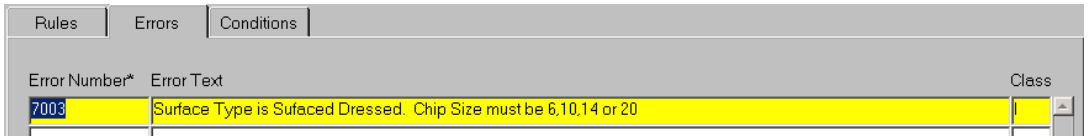

Figure 70 - Error Message

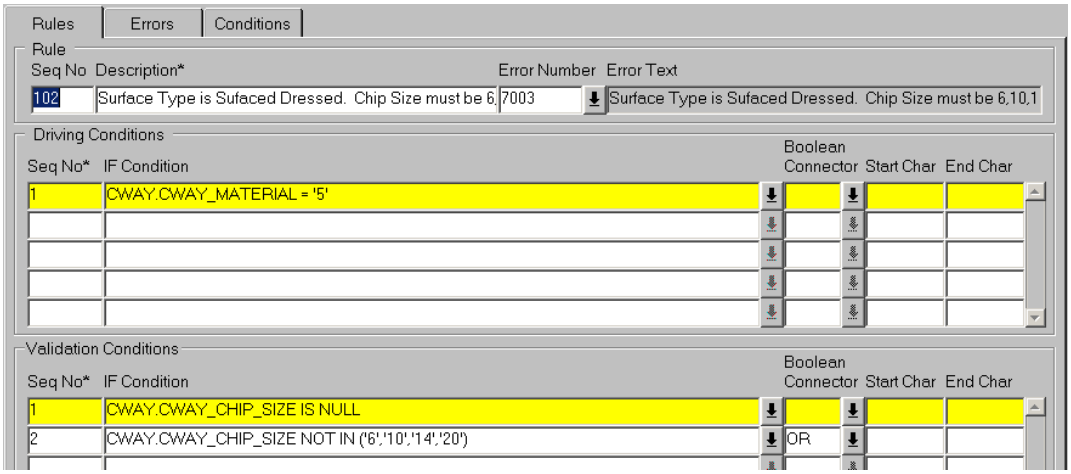

Figure 71- Rule 3

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2.9.5 **Rule 4**

Rule 4 states that "If the Surface Type is not Surface Dressing then the Chip Size must not be entered." Figure 72 to Figure 74 show the metadata definition for Rule 4.

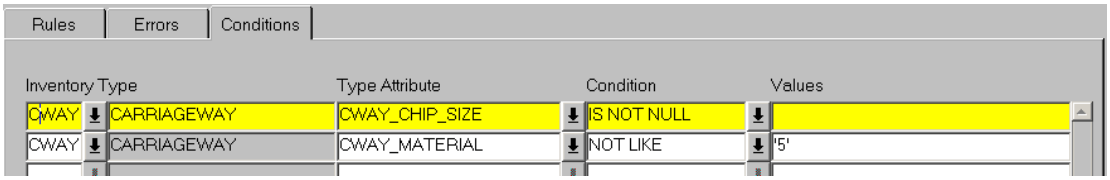

Figure 72 – Conditions

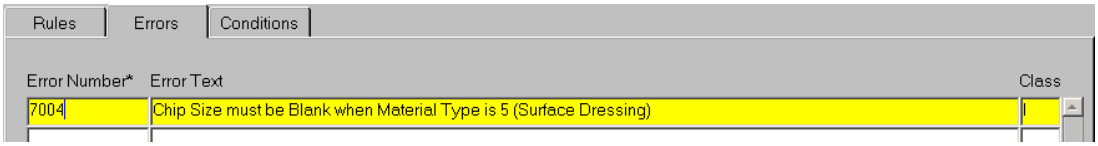

Figure 73 - Error Message

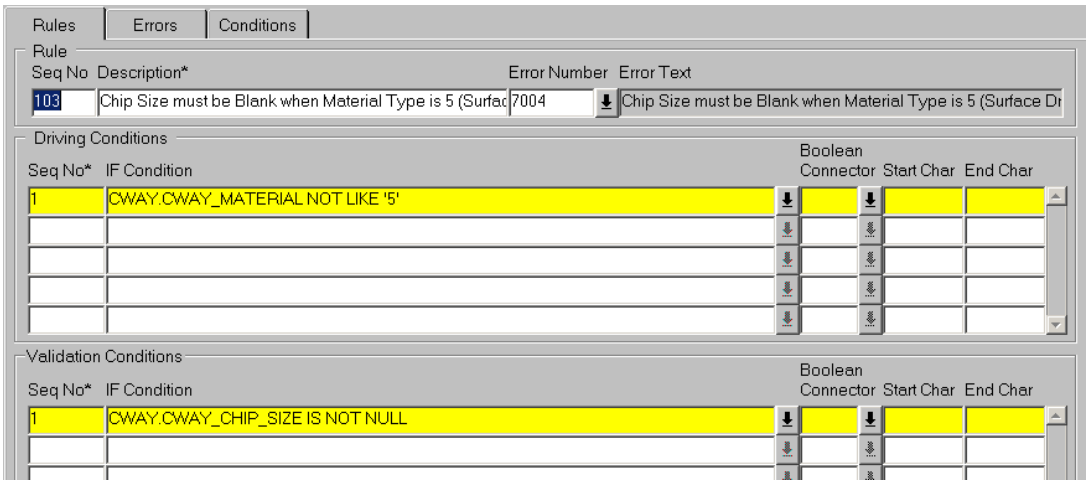

Figure 74 - Rule 4

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2.9.6 Rule 5 (Variable Attribute Value)

Rule 5 states "The Date of the Next Inspection must be greater than the Date Last Inspected."

In this example the Cross Attribute Validation being applied to variable attribute values, *i.e.*, the Date Last Inspected will vary between Asset Item etc. To achieve this, the Condition Value which the Dependant attribute (Date Next Inspected in this example) is validated against must be entered as follows:

:NEW.<<Attribute_Name>>

where the <<Attribute Name>> is the column name used in the 'Name' field for the Attribute in the Asset Metamodel - NM0410 module.

In this example the IIT_DATE_ATTRIB86 column is used for the Date Last Inspected Attribute, therefore the Condition Value as shown in Figure 75 would be:

:NEW.IIT_DATE_ATTRIB86

Figure 75 to Figure 77 show the metadata definition for Rule 5.

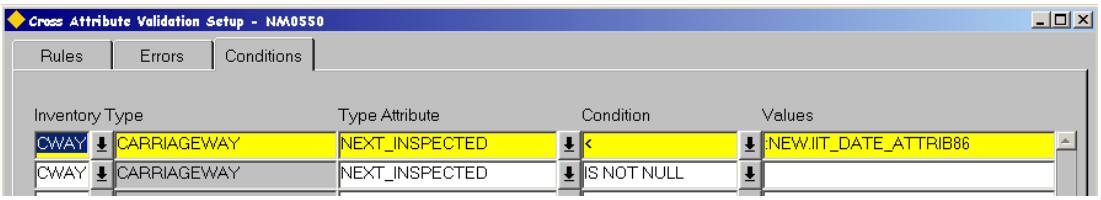

Figure 75 - Conditions

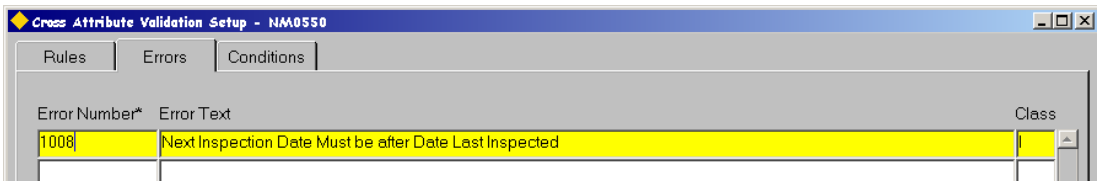

Figure 76 - Error Message

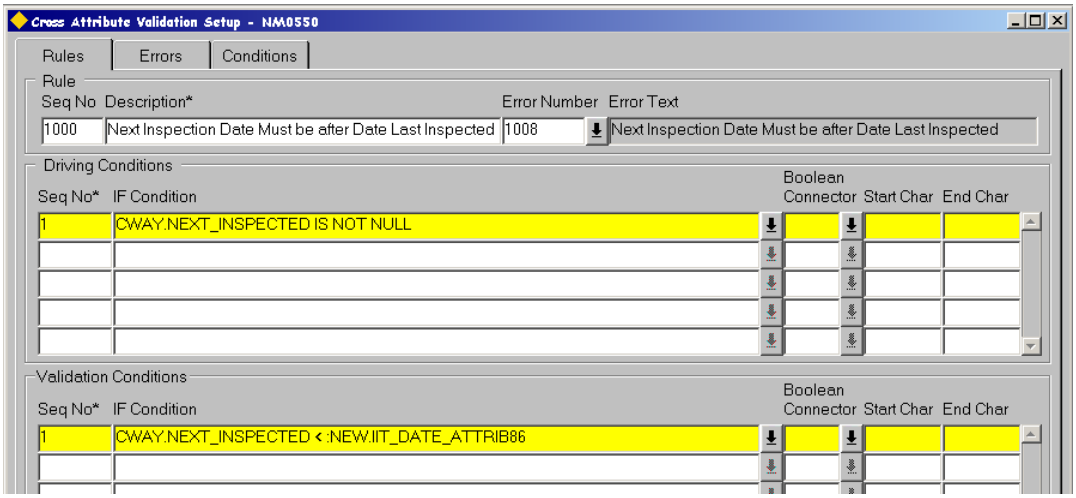

Figure 77 - Rule 5

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2.9.7 Cross Attribute Validation Conditions

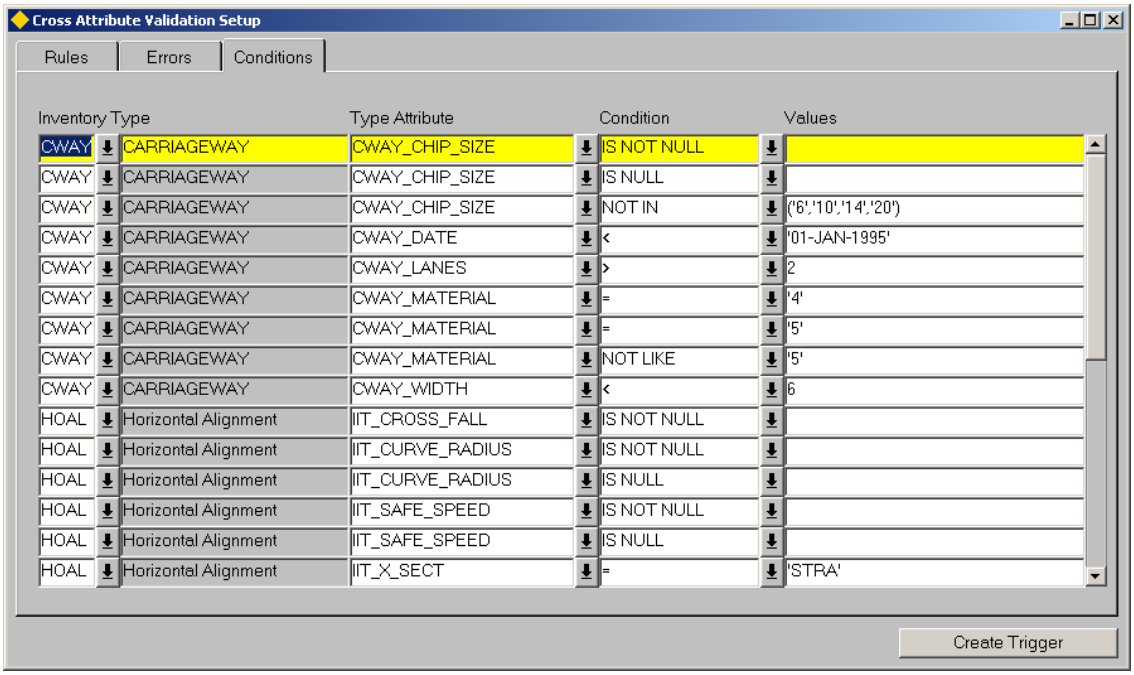
Cross Attribute Validation Setup
Rules
Errors
Conditions
Inventory Type
Type Attribute
Condition
Values
CWAY CARRIAGEWAY CWAY_CHIP_SIZE IS NOT NULL
CWAY CARRIAGEWAY CWAY_CHIP_SIZE IS NULL
CWAY CARRIAGEWAY CWAY_CHIP_SIZE NOT IN ('6','10','14','20')
CWAY CARRIAGEWAY CWAY_DATE < '01-JAN-1995'
CWAY CARRIAGEWAY CWAY_LANES > 2
CWAY CARRIAGEWAY CWAY_MATERIAL = '4'
CWAY CARRIAGEWAY CWAY_MATERIAL = '5'
CWAY CARRIAGEWAY CWAY_MATERIAL NOT LIKE '5'
CWAY CARRIAGEWAY CWAY_WIDTH < 6
HOAL Horizontal Alignment IIT_CROSS_FALL IS NOT NULL
HOAL Horizontal Alignment IIT_CURVE_RADIUS IS NOT NULL
HOAL Horizontal Alignment IIT_CURVE_RADIUS IS NULL
HOAL Horizontal Alignment IIT_SAFE_SPEED IS NOT NULL
HOAL Horizontal Alignment IIT_SAFE_SPEED IS NULL
HOAL Horizontal Alignment IIT_X_SECT = 'STRA'
Create Trigger

Figure 78 - XAV Conditions

This panel is used to define the 'IF' conditions used for both the 'Driving' and 'Evaluation' condition sets in a Cross Attribute Validation Rule. A Cross Attribute Validation Condition may be used in multiple Rule sets.

Asset Type ***(Required)*** ***List***

Enter the Asset Type code to which the condition applies. The Asset Item Type description will be displayed in the adjacent field.

Type Attribute ***(Required)*** ***List***

Select the Attribute of the Asset Type to which the condition applies. The List of allowable values will display the View 'Column Name' and 'Column Text' entries as defined in the Attributes Panel of the Asset Metamodel module for the selected Asset Type.

Condition ***(Required)*** ***List***

Enter the condition for the selected attribute. These are standard Oracle conditions and are set up and maintained using Domains - HIG9120 and updating the PBI_CONDITION option.

Values ***(Required)***

Enter the required condition Value.

Note: Values for Varchar attributes (including Domain values) should be enclosed in single quotes, *e.g.*, 'BT'. For Date attributes it may be advisable to use To_Date to ensure that the correct format mask is used *e.g.*, To_Date('01-JAN-1999', 'DD-MON-YYYY'). This will ensure that the condition will not fail irrespective of the current Default format mask of the Database.

To enter a list of values brackets should be used, *e.g.*, ('6','10','14','20'). If a condition of 'BETWEEN' is selected the values should be seperated with an AND statement, *e.g.*, Between 2 AND 5.

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2.9.8 Cross Attribution Validation Errors

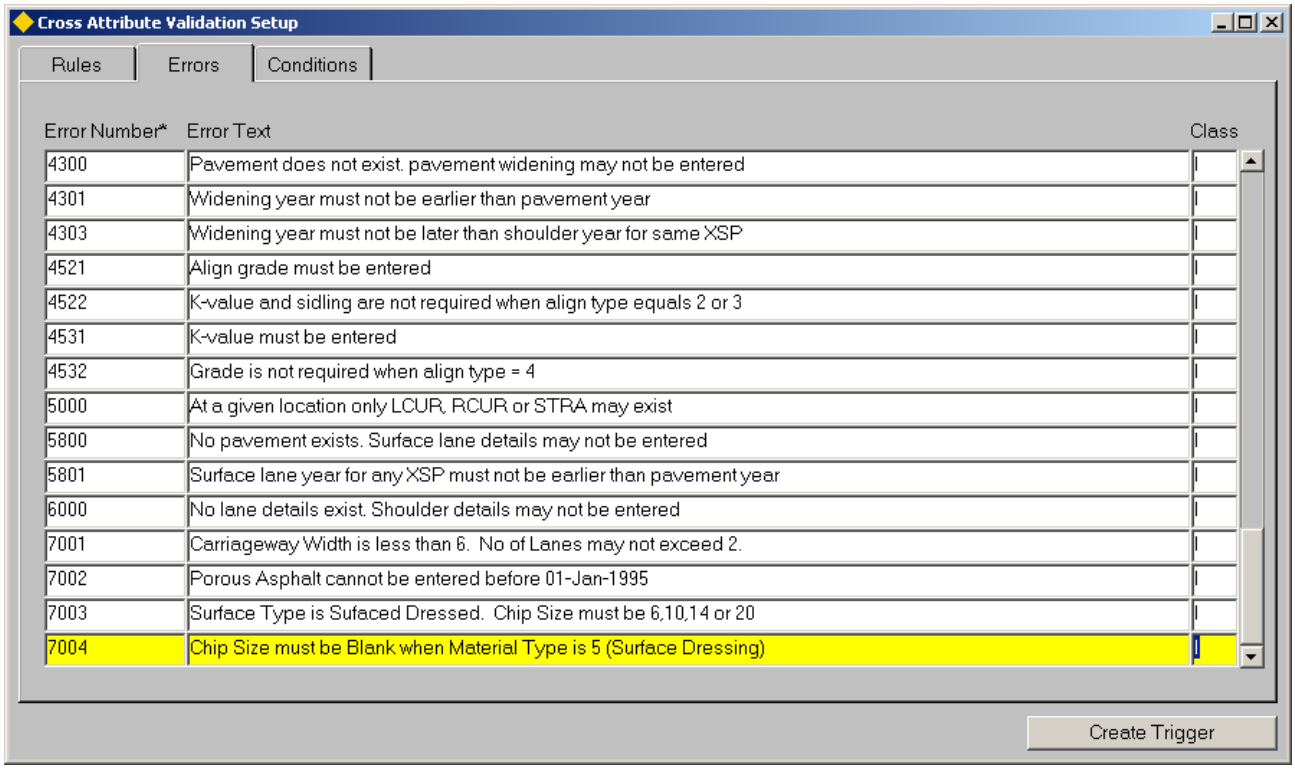
Cross Attribute Validation Setup
Rules
Errors
Conditions
Error Number*
Error Text
Class
4300 Pavement does not exist. pavement widening may not be entered
4301 Widening year must not be earlier than pavement year
4303 Widening year must not be later than shoulder year for same XSP
4521 Align grade must be entered
4522 K-value and sidling are not required when align type equals 2 or 3
4531 K-value must be entered
4532 Grade is not required when align type = 4
5000 At a given location only LCUR, RCUR or STRA may exist
5800 No pavement exists. Surface lane details may not be entered
5801 Surface lane year for any XSP must not be earlier than pavement year
6000 No lane details exist. Shoulder details may not be entered
7001 Carriageway Width is less than 6. No of Lanes may not exceed 2.
7002 Porous Asphalt cannot be entered before 01-Jan-1995
7003 Surface Type is Sufaced Dressed. Chip Size must be 6,10,14 or 20
7004 Chip Size must be Blank when Material Type is 5 (Surface Dressing)
Create Trigger

Figure 79 - Error Messages

This panel is used to maintain the Error messages that are associated with a Cross Attribute Validation Rule set. If the Error is triggered it will be displayed to the User in a dialogue box, an example of which is shown in Figure 80.

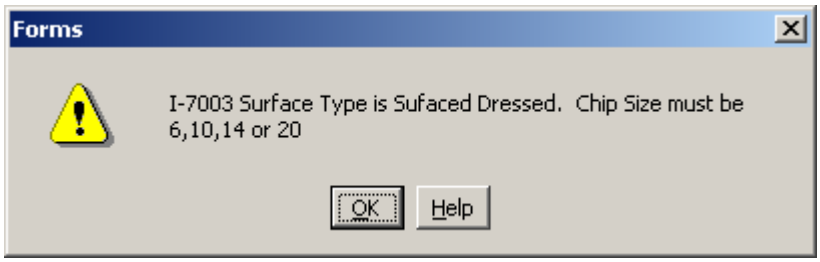

Figure 80

Error Number ***(Required)***

Enter a unique number for the Error.

Error Text ***(Required)***

Enter the text to be displayed to the User if the data entered fails validation. A maximum of 80 Characters is allowed.

Class ***(Required, Default)***

This is reserved for future development and will default with 'I' – Asset.

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2.9.9 Cross Attribute Validation Rules

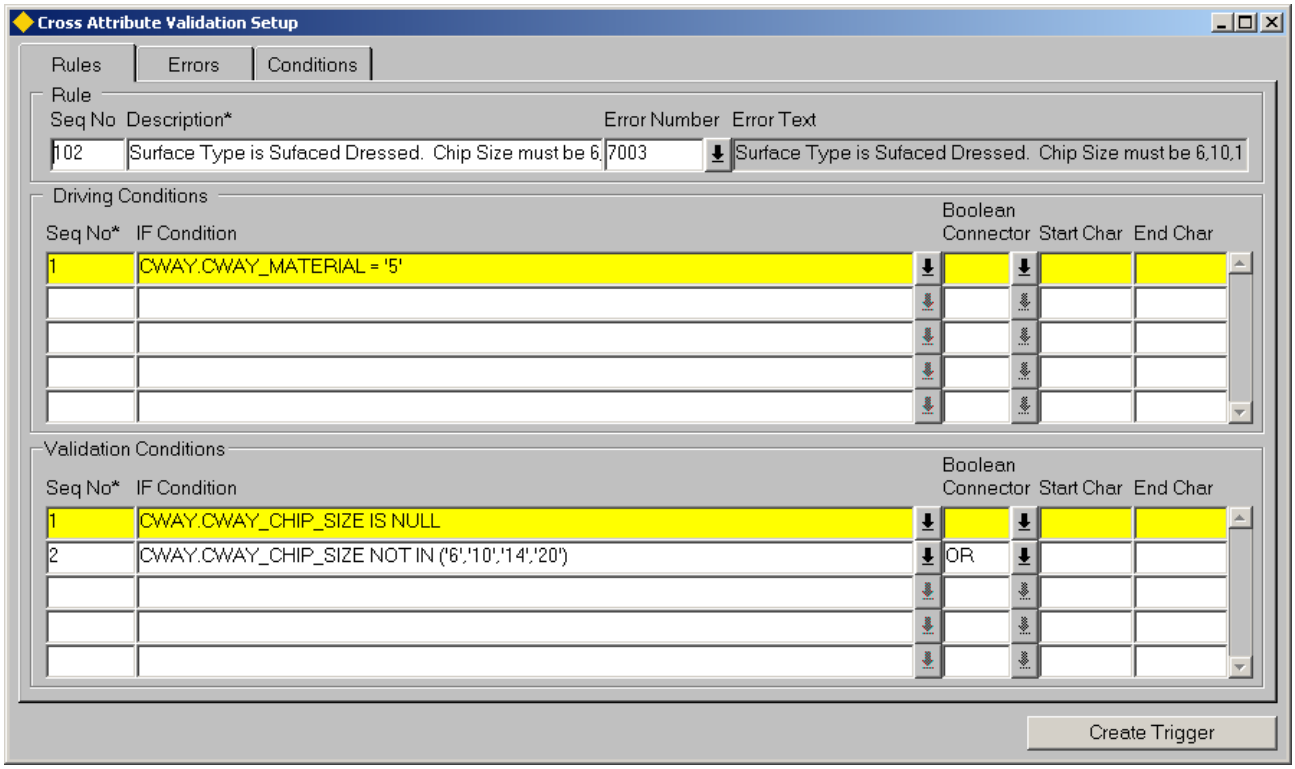

Figure 81 - XAV Rules

This window is used to maintain the Cross Attribute Validation Rule sets and utilises the Conditions and Errors previously defined. Before the Rules can be used the [Create Trigger] button must be pressed to allow the system to create the required Database Triggers.

Note: The Triggers may be recreated when any changes to the metadata are saved by pressing the [Save] button on the menu toolbar or pressing [F10].

The window is divided into 3 panels.

2.9.9.1 Rule Panel

Seq No. ***(Optional)***

Enter a unique sequence number for the Rule. This sequence number will establish the order by which any Rules associated with an Item are evaluated. If a Seq No. is not entered the Rule will evaluated after all other Rules for the Item.

Description ***(Required)***

Enter a description for the Rule set. Note that the description is NOT displayed to the User if an Attribute fails the Cross Attribute Validation.

Error Number ***(Required)*** ***(List)***

Enter the Error number of the error to be displayed to the User if an Attribute fails the Cross Attribute Validation. Errors will have been previously defined in the 'Errors' window of the module (Page 82).

The Error Text will be displayed in the adjacent field.

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2.9.9.2 Driving & Validation Condition Panels

Seq No. ***(Required)***

Enter a sequence number for the Condition. This will define the order in which conditions will be evaluated.

IF Condition ***(Required)*** ***(List)***

Select the required Condition. The Condition name will be a concatenation of the Asset Item Type Code and the View Column Name as defined in the Asset Metamodel – NM0410 module for the validated Attribute, *e.g.*, CWAY.CWAY_CHIP_SIZE. Conditions will have been previously defined in the 'Conditions' window of the module (page 81).

Boolean Connector ***(Optional)*** ***(List)***

If multiple Conditions are used within the set the relationship between the Conditions must be specified. The allowable connectors are AND or OR.

Start Char/End Char ***(Optional)***

Start and End Char are for creating more complex boolean expressions. *e.g.*, consider IF (cond1 OR cond2) AND cond3. Cond1 would have a start char of '(' and Cond2 would have an end char of ')'.

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2.10 Merge File Extract Definition – NM7055

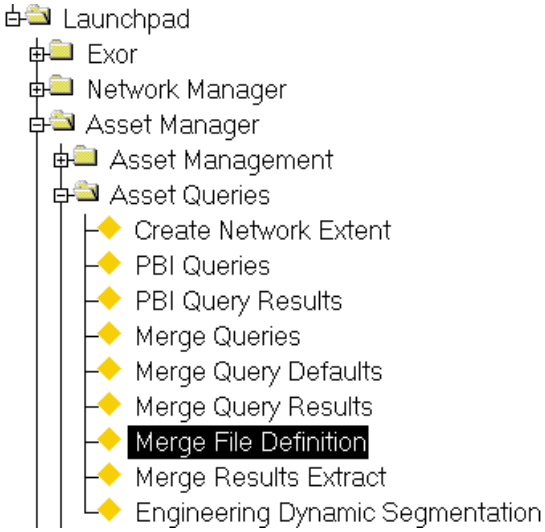

Figure 82 - Merge File Extract

The Merge File Extract Definition – NM7055 module is used to specify the information from the results of a Merge Query to be extracted to an external file using Merge Results Extract – NM7057 (see the Asset Manager User Guide for more information).

The Merge Results may be extracted into one or all of the following file formats simultaneously:

- Fixed Width
- Comma Separated
- HTML

Note: There is no significant degredation of performance when multiple file format extracts are specified in the Merge Results Extract – NM7057 module.

Each Merge File Extract definition is applicable only to the Merge Query specified in the 'Merge Query' field and has a single Output file name, although this Filename may be prefixed when Extracting a set of Merge Results.

When a new Merge Query is defined using Merge Query Setup – NM7050, 4 new Database views are created. The Merge File Extract Definition uses these Views as the source of the required information.

The Database Views are created using the following naming conventions:

V_MRG_<Query Unique>

V_MRG_<Query Unique>_SEC

V_MRG_<Query Unique>_VAL

V_MRG_<Query Unique>_VLS

For example a Merge Query with a Name of EXOR would result in the following 4 views being created:

V_MRG_EXOR

V_MRG_EXOR_SEC

V_MRG_EXOR_VAL

V_MRG_EXOR_VLS

The View(s) available for selection as the Source of the Merge Query results in the 'Src' field is determined by whether the 'Join to Datum' check box is selected. If the Merge File Extract requires locational information relating to the Datum Elements, *e.g.*, Datum Element Unique, Begin and End Offsets, the 'Join to

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Datum' checkbox should be selected. The available 'Source' view will then be the V_MRG_<Query Unique> Database View. If the flag is selected, any homogeneous 'chunks' of Network identified by the Merge Query, which span multiple Datum Network Elements will be 'split' and a separate row of data will be created in the Extract File for each Datum Element. Consider an example.

Figure 83 shows the results of a Merge Query based on Pavement Width. An homogeneous extent of network has been identified which spans 3 Elements. Table 7 shows the results of an Extract File where the 'Join to Datum' flag has not been selected. Table 8 shows the results of the same Extract File but where the 'Join to Datum' flag has been selected.

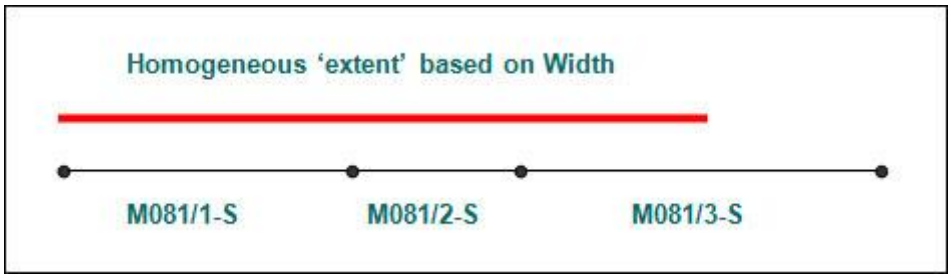

Figure 83

Table 7

Route	*Begin Offset*	*End Offset*	*Width*
M081	0	6.39	7.2

Table 8

Element	*Begin Offset*	*End Offset*	*Width*
M081/1-S	0	4720	7.2
M081/2-S	0	670	7.2
M081/3-S	0	1000	7.2

Table 9 shows some of the available Columns within the V_MRG_<Query Unique> view.

Table 9

View Column Name	*Description*
Attribute 1 Value	The first attribute value used in the Merge Query.
Attribute 2 Value	The second attribute value used in the Merge Query.
Attribute 3 Value	The third attribute value used in the Merge Query.
Etc…	The xxx attribute value used in the Merge Query.
NMS_OFFSET_NE_ID	The NE_ID of the 'Parent' Route
OFFSET_NE_UNIQUE	The Unique name of the 'Parent' Route
NMS_BEGIN_OFFSET	Begin Offset of homogenous extent relative to parent Route
NMS_END_OFFSET	End Offset of homogenous extent relative to parent Route
NQR_DATE_CREATED	Date the Merge Query Result was created
NQR_DESCRIPTION	Description of Merge Query Results

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PNT_OR_CONT	Point or Continuous Item Flag (P or C)
Attribute 1_COUNT	The total number of Items for Attribute 1 within the homogeneous extent.
Attribute 2_COUNT	The total number of Items for Attribute 2 within the homogeneous extent.
Attribute 3_COUNT	The total number of Items for Attribute 3 within the homogeneous extent.
Etc…	
NSM_NE_ID	The NE_ID of the Datum Element on which the homogeneous extent is located
DATUM_NE_UNIQUE	The Unique name of the Datum Element
NSM_BEGIN_MP	Begin Offset of homogenous extent relative to Datum Element
NSM_END_MP	End Offset of homogenous extent relative to Datum Element

When the 'Join to Datum' flag is not selected the V_MRG_<Query Unique>_SEC and V_MRG_<Query Unique>_VAL Database Views are available as the 'Source' of the Merge Query Results.

The V_MRG_<Query Unique>_SEC view is essentially the source of the locational information of each homogenous extent of Network identified by a Merge Query, whilst the V_MRG_<Query Unique>_VAL view provides the source for the Asset Attributes used as 'Splitting Agents' in the Merge Query definition.

Table 10 shows some of the available Columns within the V_MRG_<Query Unique>_SEC view.

Table 10

View Column Name	***Description***
NMS_OFFSET_NE_ID	The NE_ID of the 'Parent' Route
NMS_BEGIN_OFFSET	Begin Offset of homogenous extent relative to parent Route
NMS_END_OFFSET	End Offset of homogenous extent relative to parent Route
NQR_DATE_CREATED	Date the Merge Query Result was created
NQR_DESCRIPTION	Description of Merge Query Results
PNT_OR_CONT	Point or Continuous Item Flag (P or C)
Attribute 1_COUNT	The total number of Items for Attribute 1 within the homogeneous extent.
Attribute 2_COUNT	The total number of Items for Attribute 2 within the homogeneous extent.
Etc…	

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The V_MRG_<Query Unique>_SEC view contains a column for each of the Attributes used as 'Splitting Agents' in the Merge Query definition. The naming convention of the Database View Columns is as follows:

<Asset Type Code>_<View Attribute>

For example, **PAOR_PAVE_YEAR**, where PAOR is the Asset Type code and PAVE_YEAR is the View Attribute name of Pavement Year Attribute (see page 32 for more information on the View Attribute field).

or

<Asset Type Code>_<XSP>_<View Attribute>

if the Asset Item has an associated XSP

For example, **CORO_L_PAVE_YEAR**.

In addition to the Data available via the Merge Query Database Views, application specific Function Calls may also be made to a Database Package named NM3NET to include associated Data held in other Database Tables within the File Extract. For example, NM3NET.GET_NE_UNIQUE(NMS_OFFSET_NE_ID) and NM3NET.GET_NE_DESCR(NMS_OFFSET_NE_ID) will return the Unique Name and Description of a Group respectively based on its unique internal identity (NE_ID). Other Function Calls include:

NM3NET.GET_DATUM_ELEMENT_LENGTH

NM3NET.GET_START_NODE

NM3NET.GET_END NODE

Standard Oracle Formatting Functions may also be used, *e.g.*, LTRIM(TO_CHAR(<fieldname>), ' ')

If Engineering Dynamic Segmentation has been implemented Function calls may also be made to a Database Package named NM3ENG_DYNSEG to allow the following Engineering Dynamic Segmentation Analysis functions to be included in the Merge Extract:

- Mean Value
- Variance
- Biased Variance
- Standard Deviation
- Biased Standard Deviation
- Median Value
- Length Weighted Average
- First Value
- Last Value
- Sum
- Minimum Value
- Maximum Value
- Most Common Value
- Most Frequent Value
- Value Count

Full details of these functions including the syntax needed can be found on page 117.

For more information on available Function Calls contact Exor Support at support@exorcorp.com

Attribute Values within a Merge Query Result may be decoded in the Merge Extract definition. For example, if a Merge Query definition included the 'Accident Severity' attribute of an Asset Type of 'Accident' (note that data from Accidents Manager by Exor may be used in Merge Queries via the use of Foreign Tables) which holds the Severity as a Numeric Value, *e.g.*, 1,2 or 3, the Accident Severity may be Decoded within the Merge Extract so as to output the Severity Description, e.g a value of '1' is extracted as 'Fatal', '2' as 'Serious' etc.

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2.10.1 **Merge Output File Panel**

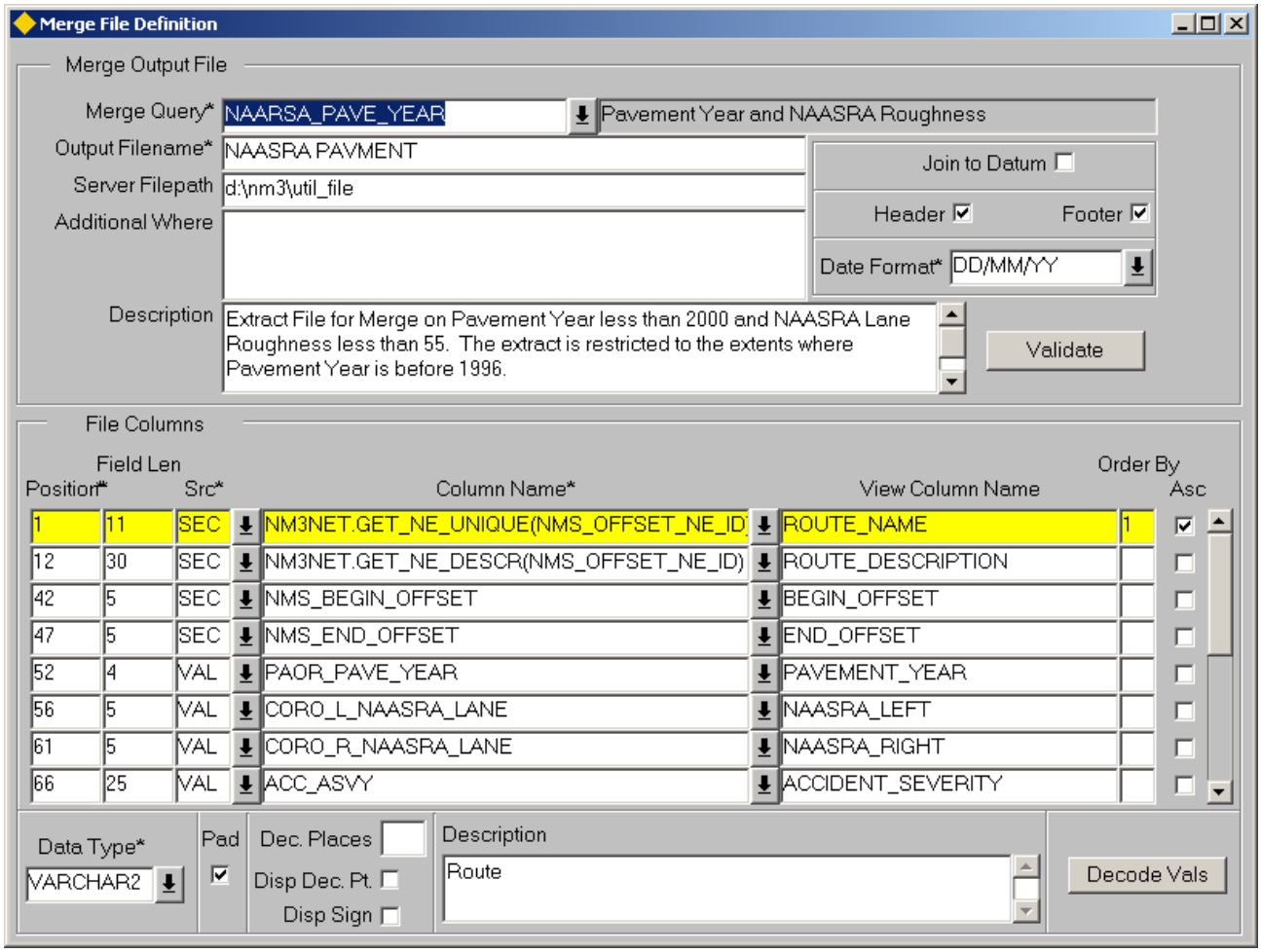

Figure 84 – Merge Output File Panel

The Merge Output File form is divided into 2 main panels. The Merge Output panel mainly relates to the associated Merge Query and the Output File name and path. The File Columns panel allows the required data to be extracted to be defined any Decode Values to be specified.

Merge Query ***(Required)*** ***List***

Select the required Merge Query to associate with the Merge Output File. The List of Merge Queries will be restricted to the Queries to which the User has Role based access. (Refer to the Asset Users Guide for more information on Role Based security on Merge Queries)

The Merge Query description will be displayed in the adjacent field.

Output File Name ***(Required)***

Enter the required name for the Output File(s). This Output Filename may be prefixed when the results are extracted using NM7057 – Merge Results Extract (refer to the Asset Users Guide for more information on the Merge Results Extract module).

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Server Filepath ***(Required, Default)***

Enter the required path for the Output File. The Filepath will default to the value specified in Product Option UTLFILEDIR.

Note: If the following entry is made in the INIT.ORA file any value may be entered.

utl_file_dir=* (NT)

utl_file_dir=/ (Unix)

This default Server Filepath may be amended if required and may be defined as any valid UNC address (Universal naming Convention), *e.g.*, \\cstewart\mergeoutputs

Note: Root directories cannot be specified as the Server Filepath.

Additional Where ***(Optional)***

The data within the Merge Results set to be Extracted may be restricted by defining a 'Where Clause' in the Merge File Extract Definition. Figure 84 shows an example where an Extract is being restricted to where the Pavement Year (PAOR_PAVE_YEAR) is less than 1994. The values for VARCHAR attributes should be enclosed in single quotes.

Note: The word 'WHERE' is not required within the statement.

Description ***(Optional)***

If required enter a description for the Merge Output File.

Join to Datum ***(Checkbox)***

Check this box if Locational information relating to the Datum Network Elements is required. Refer to page 85 for more information on the 'Join To Datum' option.

Header ***(Checkbox)***

Check this box if a Header record is required on the Output File. Note that a Header Record is only applicable to a 'Fixed Width' file and will not be created on an HTML or CSV File Extract.

The format of the Header Record is as follows:

<000><Output Filename><YearMonthDay><Time>

For example, 0002NAASRA PAVMENT200203190841, where <000> is the record type, <2NAASRA PAVEMENT> is the Output Filename, <20020319> is the date on which the Merge Extract File was created in the format of YYYYMMDD and <0841> is the time at which the Merge Extract File was created.

Footer ***(Checkbox)***

Check this box if a Footer record is required on the Output File. Note that a Footer Record is only applicable to a 'Fixed Width' file and will not be created on an HTML or CSV File Extract.

The format of the Footer Record is as follows:

<999><Number of Detail Records in Output File>

For example, 999000002011.

Date Format ***(Required)*** ***List***

Select a Valid date Format for the output of any Date Fields. The list of allowable Date Formats is maintained using module Domains-HIG9120 and Domain Name DATE_FORMAT_MASK.

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2.10.2 File Columns Panel

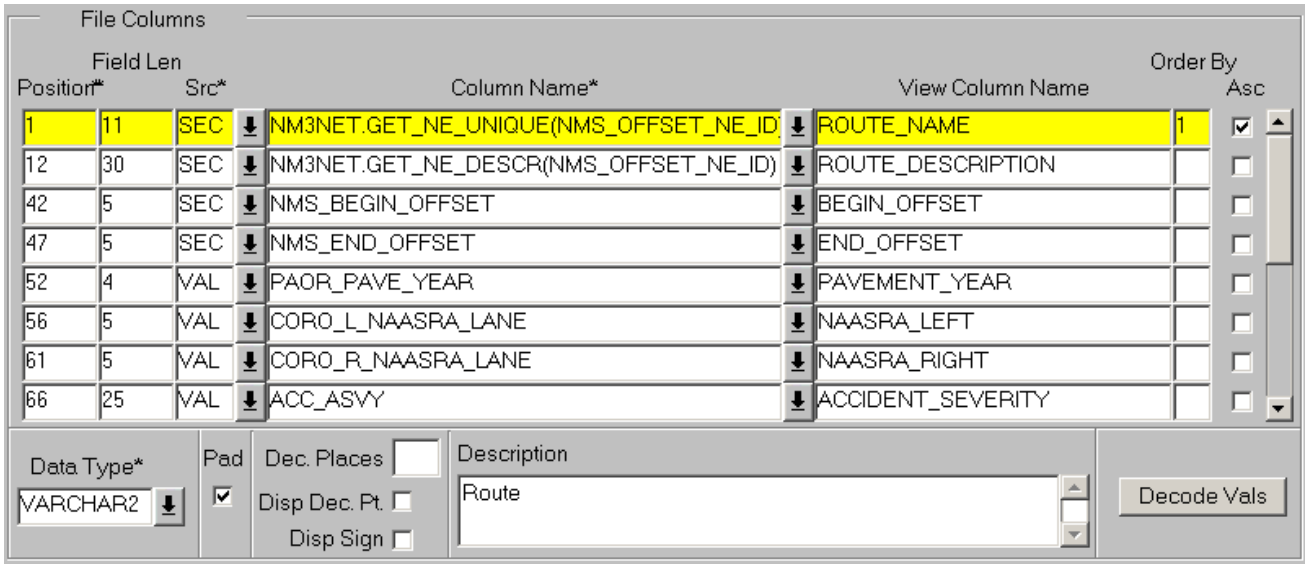

Figure 85 – File Columns Panel

The File Columns panel is used to define the contents of the Extract File and specify their position within it. The 'Extracted' data may be from a Column in one of the Merge Database Views, associated data held in other Database Tables via a Function Call (see page 88) or a freehand text entry.

Note: Freehand text should be enclosed in single quotes.

Position ***(Required)***

The start position of each column within the Extract File will be calculated based upon the starting position and length of the previous column. The start position of the first column entered will default to '1'.

Field Length ***(Required)***

Enter the Length of the field to be included in the Extract File.

Src ***(Required)*** ***List***

Select the Source Database View for the record. The List of allowable values will be determined by whether the 'Join to Datum' checkbox has been selected (see page 85 for more information on the 'Join To Datum' checkbox).

Column Name ***(Required)*** ***List***

Select the required column from the selected Source view or enter a Function call. If a 'freehand' text string is required, *e.g.*, 'End of File' ensures that it is enclosed in single quotes.

Note: If a freehand text string is entered the choice of the Source View is unimportant.

View Column Name ***(Optional, Default)***

Enter a Name for the Column. The name should comprises of Alphanumeric characters with no spaces, underscores are allowable. This View Column Name will be used as the Column Heading if the File is extracted in HTML format. If no value is added the View Column Name will default to a value of 'COL_<start string position>, *e.g.*, COL_110.

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Note: If a Description is entered for the File Column, it will be used in preference to the View Column Name as the Column Heading if the File is extracted in HTML format.

Order By *(Optional)*

The order in which the Merge Query Results Extract is sorted may be determined by specifying the sort priority against the appropriate columns. Figure 85 shows an example of where the primary sort is carried out on the Route Name and a secondary sort is performed on the Begin Offset Column.

Asc *(Checkbox)*

When an Order By is specified the default sort order will be in Ascending Order. Uncheck this box if descending Order is required.

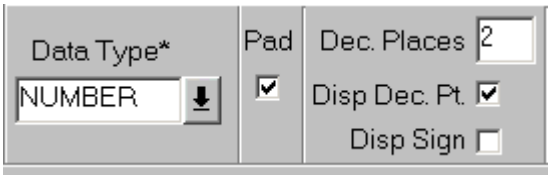

Figure 86

Data Type *(Required)* *List*

Select the Data Type of the data to be extracted. This must be the Data Type of the data as it will be presented in the Extract File which may not necessarily be the same as the Data Type in the Merge Query Results. For example if a TO_CHAR function is used to convert a numeric value to a VARCHAR the Data Type must be specified as a VARCHAR2. Similarly if Decode Values are used to decode a Numeric Value to a text string the Data Type must be specified as a VARCHAR2.

The 'Dec. Places', 'Disp Dec. Pt' and 'Disp. Sign' fields will only be displayed if the selected Data Type is 'NUMBER'.

Pad *(Checkbox)*

Select this Checkbox if the Extract Column is to be padded to the specified Field Length. VARCHAR2 Columns will be right padded with spaces whilst NUMBER columns will be left padded with zeros (0).

Dec. Places *(Optional)*

If the Data Type of the selected column is 'NUMBER' enter the number of decimal Places to be displayed in the Extract File.

Disp Dec. Pt *(Optional)*

Select this Checkbox if a decimal point is to be displayed in the Extract File.

Note: If the number of decimal places is not Zero this checkbox must be selected.

Disp Sign *(Optional)*

Select this Checkbox to display a plus (+) or minus (-) sign infront of Numeric Values.

Description *(Optional)*

If required, enter a Description for the Column. If a value is entered it will be used in preference to the View Column Name as the Column Heading if the File is extracted in HTML format.

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2.10.3 **Decode Values**

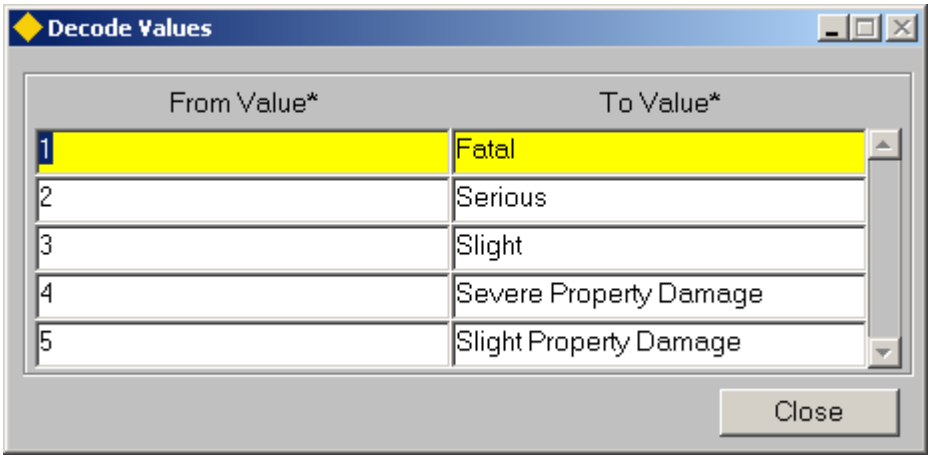

Figure 87 – Decode Values

Values from the Merge Query Results may be 'decoded' when they are Extracted to a file. Figure 87 shows an example of where Accident Severity values are being decoded to a textural description of the value meaning. Note that the Data Type for the Extract column must be the Data Type of the 'To Value'.

To call the Decode Values dialogue for the selected File Column press the [Decode Vals] button on the form.

From Value ***(Required)***

Enter the value from the Merge Query Results to be decoded.

To Value ***(Required)***

Enter the 'decoded' value for the Merge Query Result.

Before the Merge Extract File Definition can be used it should be validated. This is done by pressing the [Validate] button.

The results of a Merge Query may be extracted using module NM7057 – Merge Query Extract that may be called using the [E] Extract to File button on the floating toolbar in the Merge Query Results – NM7051 module or directly from an Exor menu option.

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2.11 Derived Asset Set-up – NM0420

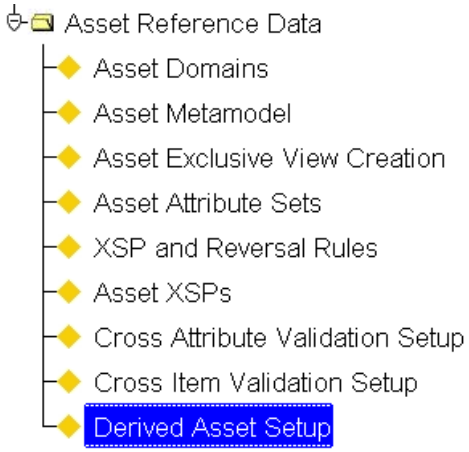

Figure 88 - Derived Asset Set-up Menu

Modern Asset Management practices and Asset Management Plans are strongly influencing how asset managers design their asset models. These asset models must satisfy the needs of an ever-increasing number of business requirements, from Routine Asset Maintenance to Asset Valuations.

This invariably leads to a very ‘granular’ asset model, which is generally based on the lowest level of detail, needed for a particular business requirement. For example, the cross section of the Maintained Roadway may be modelled as many separate Asset Types with each type representing a constituent part of the Roadway as shown in Figure 89. Each of these Asset Types would be attributed to hold details such as ‘Lane width’.

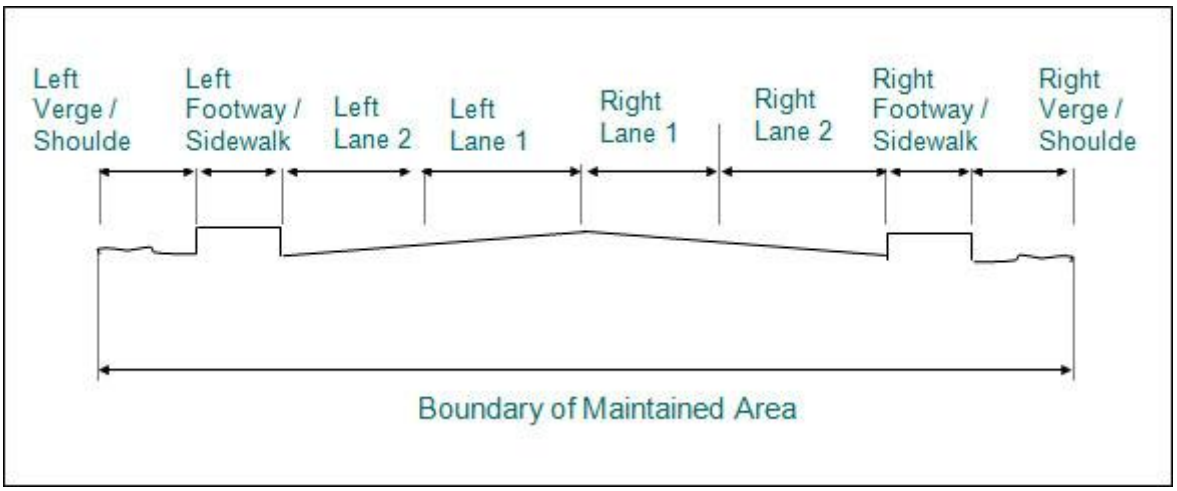

Figure 89 – XSP’s

This very detailed view of the overall Roadway Asset may satisfy the needs of a Pavement Engineer, but may be too detailed and complex when calculating the value of the Roadway, where an overall ‘Width’ value may be required.

Using the Derived Asset functionality the Asset Manager can automatically create ‘composite’ Asset Types, where the asset data is derived from other Asset Types. For example, a Derived Asset Type of ‘Pavement’ could be created to summarise values held for the Assets shown in Figure 89. This derived ‘Pavement’ Asset Type could have an attribute of ‘Width’ which would be a calculated value based upon the ‘width’ attribute of each of the Assets used within the derivation. The derived ‘Pavement’ Asset Type could also have a calculated attribute value of ‘Total Surface Area’ that could in turn be used for Asset Valuations.

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Derived Asset Types may be created from any Asset data held within the Exor system, data held in 'external tables' of which the Exor system is aware or even other Derived Asset Types.

Once create Derived Assets may be displayed within Spatial Manager, Exor's web mapping environment and may be used in all standard Exor query and reporting tools.

2.11.1 **Defining Derived Assets – Process Flow**

Derived Assets are essentially created from the results of Merge Queries that are run against the required Network Types. The results of the Merge Query are then 'mapped' onto the appropriate Derived Asset Attributes.

Before any Derived Assets can be created there are 3 steps, which must be undertaken to define the metadata needed for a Derived Asset Type. These are :

- Create Derived Asset Type Metadata using NM0410 – Asset Metamodel
- Define the Merge Query using NM0750 – Merge Queries
- Create the 'attribute mapping' from the merge Query results to the Derived Asset Type using NM0420 – Derived Asset Setup

The process flow for creating Derived Assets in shown in Figure 90.

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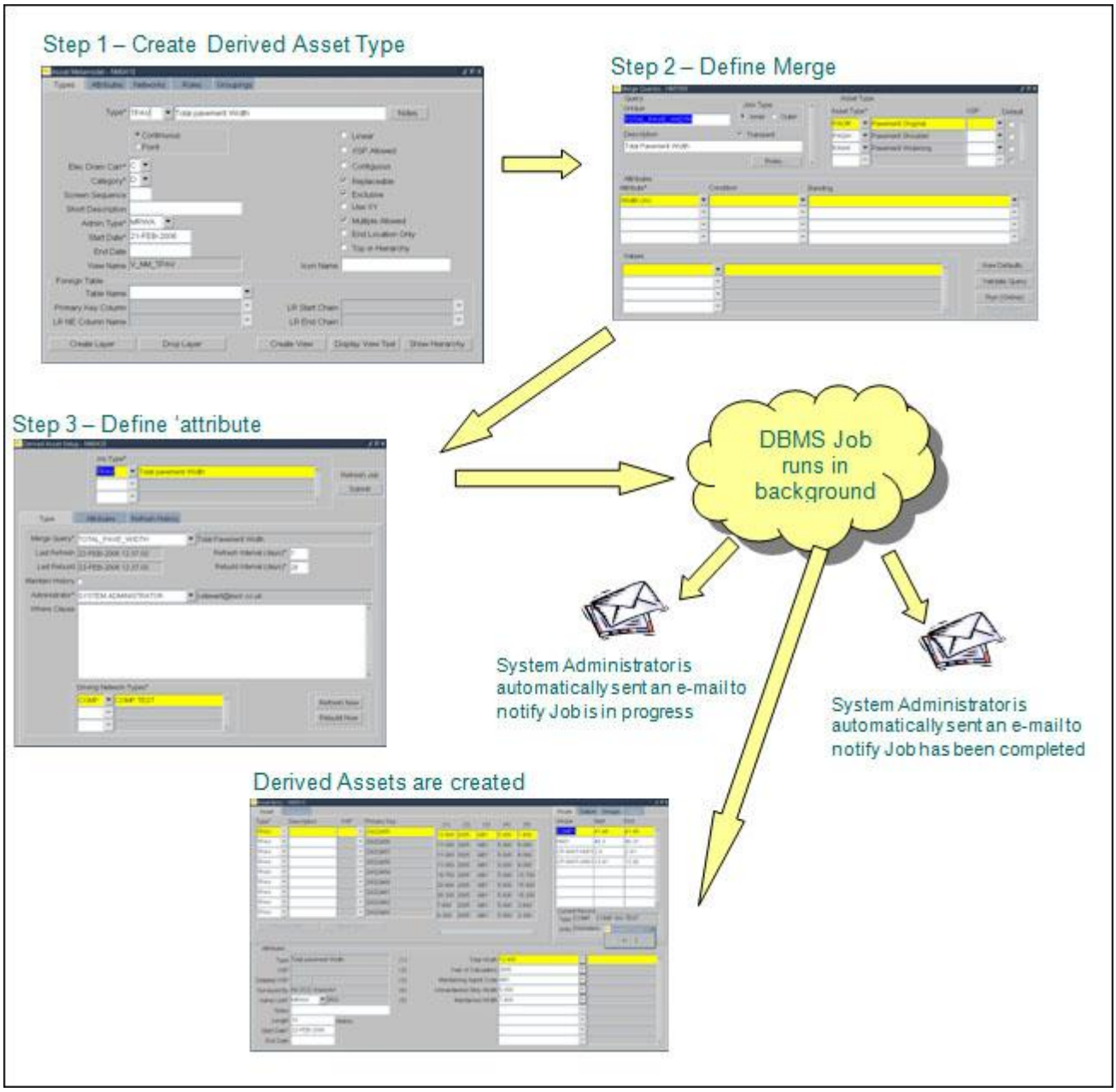
Step 1 – Create Derived Asset Type
Step 2 – Define Merge
Step 3 – Define 'attribute
DBMS Job runs in background
System Administrator is automatically sent an e-mail to notify Job is in progress
System Administrator is automatically sent an e-mail to notify Job has been completed
Derived Assets are created

Figure 90 – Derived Asset Creation Process

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2.11.2 Creating the Derived Asset Type

The Derived Asset Type is created in the same way as any other Exor Asset Type, using the NM0410 – Asset Metamodel module (see page 15 for full details). However, there are two rules that must be applied to Derived Assets. These are:

- The Asset Category must be 'D' – Derived (composite) Asset
- The Asset Type must be 'Exclusive'

Figure 91 – Metamodel Settings

The remainder of the Asset Type flags should be set appropriately as described in the Asset Metamodel - NM0410 documentation (page 15).

When defining the Derived Asset attributes, care should be taken to minimise the amount of data rejected during the derivation. It is advised that attribute validation such as min and max values are not defined for any Derived Asset attributes as this may lead to rejections if the derived values are outside the allowable range. Lookup Domains should also be avoided unless the derived value is guaranteed to be within the Asset Domain.

The appropriate base Datum Network(s) on which the Derived Assets may be located should be defined correctly. It is important that all Datum Network Types which are members of the 'Driving Network' Types defined within the Derived Asset Setup – NM0420 module are referenced.

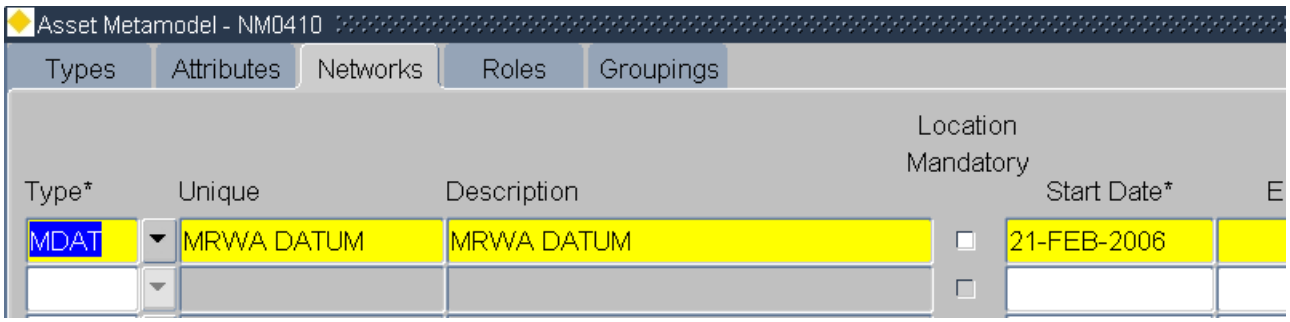

Figure 92 – Network Tab

The appropriate User Roles should also be defined for the Derived Asset Type. This will determine which Users can access the Assets and in what mode, *i.e.*, Normal or Read-only.

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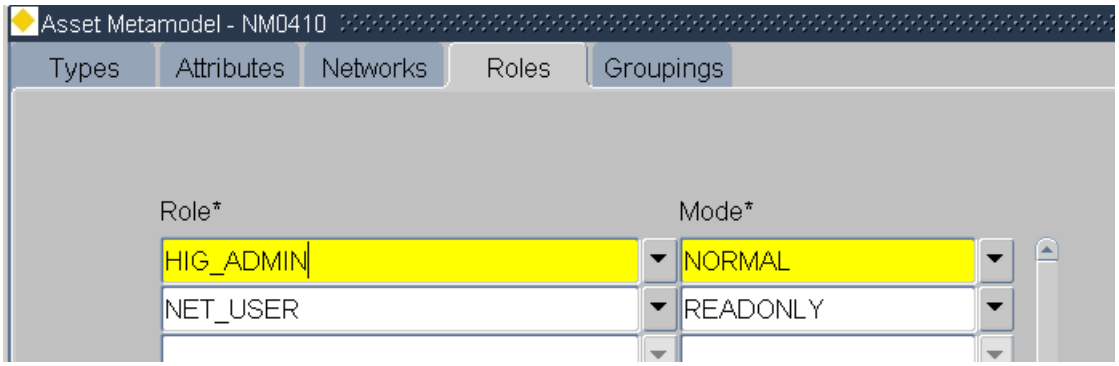

Figure 93 – User Roles

If a spatial representation of the Derived Assets is required press the [Create Layer] button on the Asset Type form. When the Asset Derivation takes place the spatial geometries of the Assets will be added to the Layer. The Derived Assets may then be displayed within Spatial Manager and / or Exor's Web mapping Environment. For full details on defining GIS Layers refer to the GIS Themes Setup documentation.

2.11.3 Creating the Merge Query

There are no special requirements needed of the Merge Query other than to note that if you are creating a point Derived Asset and you wish to include Continuous Asset attributes as well as Point item attributes, then the Merge Query should be defined as an Inner join. This means that the Merge Query will only return single points (which in turn form the basis of the Derived Asset Type).

Merge Queries are defined using NM0570 – Merge Query. For full details refer to the Asset Manager User Guide.

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2.11.4 Derived Asset Setup – NM0420

The Derived Asset Setup – NM0420 module is used to select the required Derived Asset Type and 'map' its attributes to the selected Merge Query results. It is also used to specify the 'Refresh' and 'Rebuild' intervals. These are defined as follows:

Rebuild this runs across all elements which are defined as being driving types for the Derived Asset Type

Refresh this picks up data that has changed since the last time the data was refreshed/rebuilt. It does not pick up any changes in attribute values to 'External' Assets, *i.e.*, Assets of which the Exor database is aware, but which reside outside the Exor system.

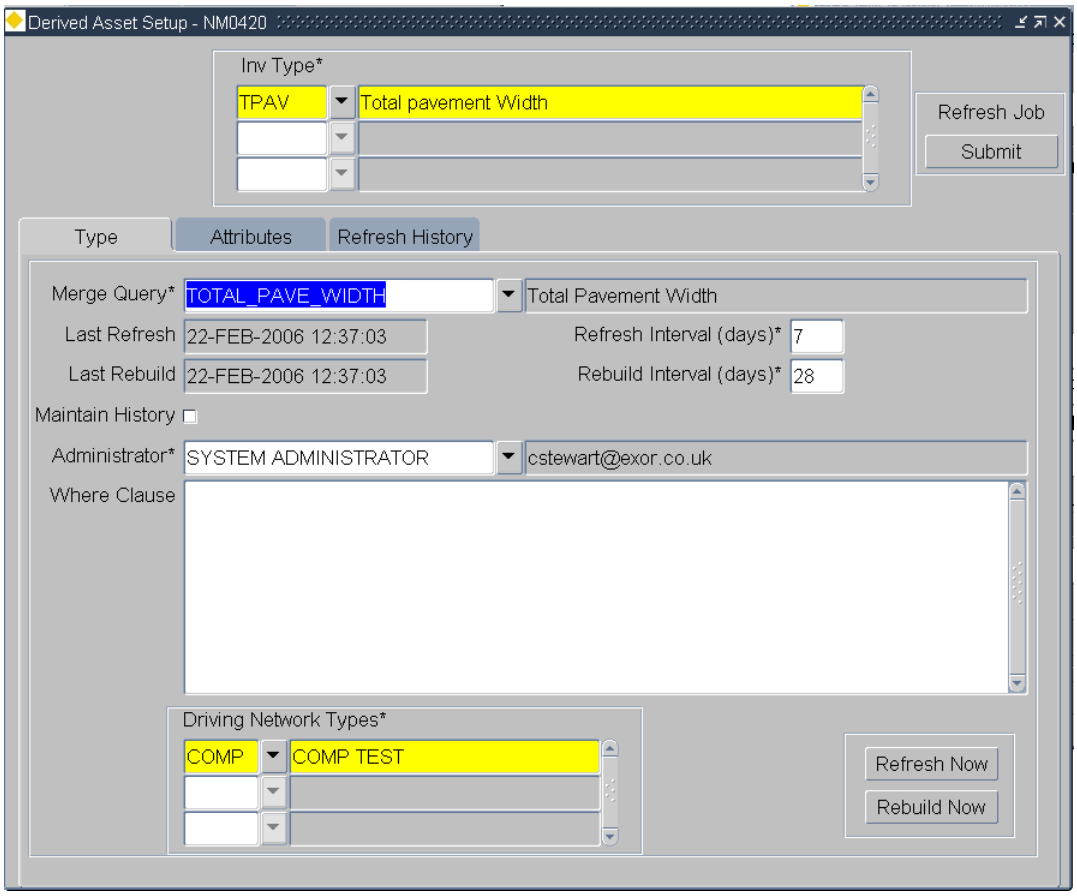

Figure 94 – Derived Asset Setup

The use of this module is best described by means of a worked example in which the Attributes of 3 separate Asset Types will be used in the Derivation of a new set of Assets.

The figure below shows a plan view of the Pavement Profile of a section of Roadway. The overall Pavement has been modelled as a series of separate Asset Types, each with their own attributes to maintain such things as 'Material', 'Year of Construction', 'Width', etc.

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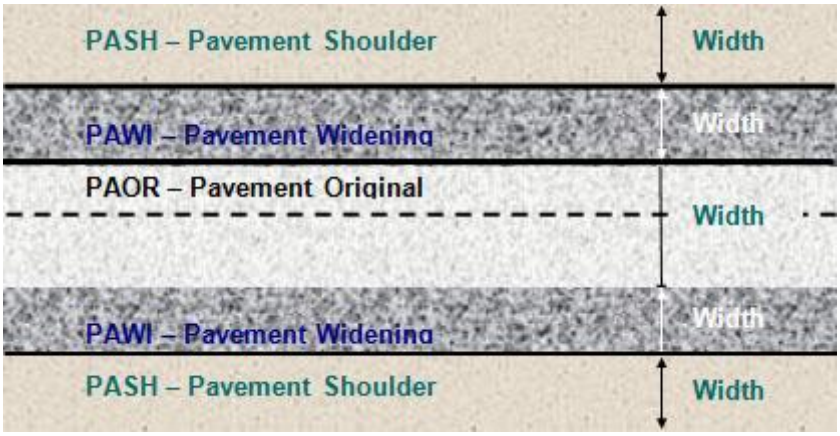

Figure 95 - Plan View of Pavement Profile

For Asset valuation purposes a 'summarised' view of the Pavement is required which provides the following:

- Total Pavement Width (sum of all widths)
- Year in which the calculation was done
- Maintaining Agent Code (a Constant value)
- Service Strip Width (a Constant Value)
- Total Maintained Width (Total Pavement Width minus Service Strip Width)
- Total Maintained Area in m2 (length of Asset multiplied by Total Maintained Width)

To achieve the summarised view and calculate the additional attribute values, such as Total Width and Total Maintained area, a Derived Asset called TPAV – Total Pavement Width will be created. Table 11 shows the Asset Metamodel Details for the Derived Asset Type.

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Table 11

Derived Asset Type									
Asset Type	Description				Point / Continuous		Category	Admin Type	
TPAV	Total Pavement Width				C		D	NET	
Asset Type Flags									
Linear	XSP Allowed	Contiguous	Replaceable	Exclusive	USE XY	Multiple Allowed	End Location Only	Top in Hierarchy	
☒	☒	☒	☑	☑	☒	☑	☒	☒	

Attributes								Flags			
Seq	Attribute Name	Screen Text	Len	Dec Plac	Format	Domain	View Attribute & Column Name	Mand.	Query	Excl	Display
1	IIT_NUM_ATTRIB100	Total Width	8	3	NUMBER		TOTAL_WIDTH	☒	☒	☒	☑
2	IIT_NUM_ATTRIB102	Year of Calculation	4		NUMBER		YEAR_OF_CALC	☒	☒	☒	☑
3	IIT_CHR_ATTRIB26	Maintaining Agent	3		VARCHAR2		MAINTAINING_AGENT	☒	☒	☒	☑
4	IIT_NUM_ATTRIB103	Service Strip Width	2		NUMBER		SERVICE_WIDTH	☒	☒	☒	☑
5	IIT_NUM_ATTRIB104	Maintained Width	8	3	NUMBER		MAINTAINED_WIDTH	☒	☒	☒	☑
6	IIT_NUM_ATTRIB105	Maintained Area	8	3	NUMBER		MAINTAINED_AREA	☒	☒	☒	☑

Networks				
Type	Unique	Description	Location Mandatory	Start Date
NET	EXOR NETWORK	EXOR NETWORK	☑	01-JAN-1990

Roles	
Role	Mode
NET_USER	NORMAL

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The Asset Types from which the TPAV - Total Pavement Width will be derived are as follows:

- PAOR – Pavement Original
- PAWI – Pavement Widening
- PASH – Pavement Shoulder

Each of the 'base' Asset Types has an attribute of 'Width' which will be used as 'spliting' agents within the Merge Query. Table 12 shows the Merge Query Details used in the TPAV – Total Pavement Width Derived Asset Setup

Table 12

Merge Query			
Unique	Description	Join Type	Transient
TOTAL_PAVE_WIDTH	Total Pavement Width	Inner	☑
Asset Types			
PAOR-Pavement Original	PAWI-Pavement Widening	PASH-Pavement Shoulder	
Attributes			
Width	Width	Width	

The third stage in creating the Derived Asset is to 'map' the Merge Query results to the appropriate TPAV – Total Pavement Width Asset attribute. This is discussed in the next section.

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2.11.5 **Derived Asset Setup**

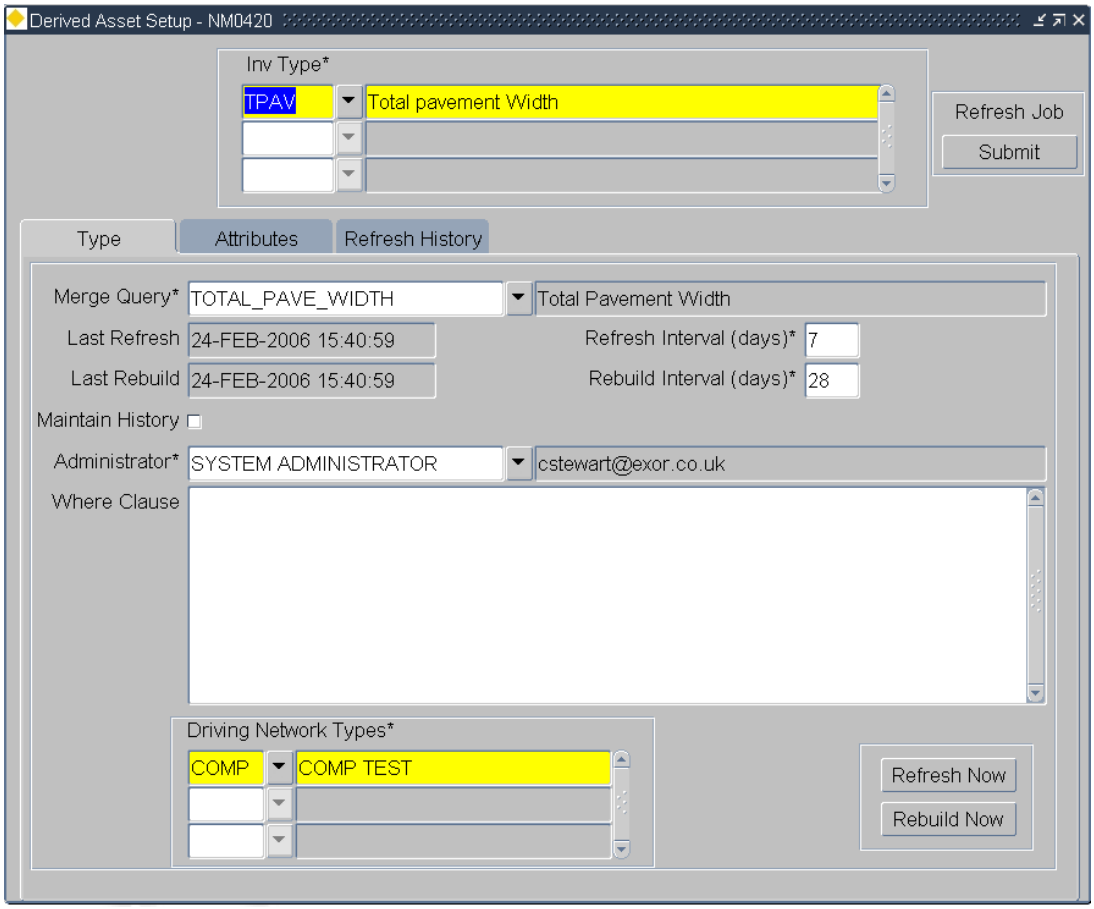

Figure 96 – Derived Asset Setup

The Derived Asset Setup – NM0420 module is used to select the required Derived Asset Type and 'map' its attributes to the selected Merge Query results.

Inv Type ***(Mandatory)*** ***(List)***

Select the required Derived Asset Type. Only Asset Types with a Category of 'D' – Derived are available for selection.

In our example the TPAV - Total Pavement Width Asset Type is selected.

2.11.5.1 Type Canvas

The Type tab canvas is used to select the Merge query on which to base the derivation on and specify the time interval for refreshing or rebuilding the Derived Assets.

Merge Query ***(Mandatory)*** ***(List)***

Select the Merge Query that forms the basis of the Derived Asset Type. The Merge Query description will be displayed in the adjacent field.

In our example the TOTAL_PAVE_WIDTH Merge Query has been selected.

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Last Refresh / Last Rebuild (Display Only)

The Date and Time of the latest Refresh or Rebuild of the Derived Assets is displayed. This is the date and Time at which the DBMS Job was started. A full history of when the Derivated Assets were refreshed can be viewed in the History tab.

Refresh / Rebuild Interval (days) (Mandatory)

The Number of days between each Refresh and Rebuild is specified using the 'Refresh Interval (days)' and the 'Rebuild Interval (days)' fields respectively. The difference between a Rebuild and a Refresh is given below.

Rebuild this runs across all elements which are defined as being driving types for the Derived Asset Type

Refresh this picks up data that has changed since the last time the data was refreshed/rebuilt. It does not pick up any changes in attribute values to 'External' Assets, *i.e.*, Assets of which the Exor database is aware, but which reside outside the Exor system. A Refresh, by definition, may be faster to run than a complete rebuild.

If the Rebuild interval is specified which is less than the Refresh interval a Warning will be displayed to notify the User (Figure 97).

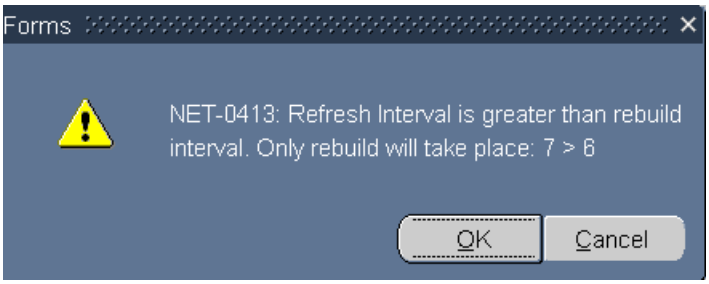

Figure 97 – Warning Message

This is only a warning message as the definition is still valid. The impact it has is that the Derived Assets will always be completely rebuilt, rather than refreshed from data changes.

In our example the values are 7 and 28 days respectively.

Maintain History (Checkbox)

The Maintain History checkbox determines whether or not existing Derived Assets and their locations are End Dated upon a Refresh or Rebuild. If History is maintained the full Effective Date functionality of the Exor system is available for Derived Assets. If no History is maintained existing Assets and their location are permanently deleted from the Database upon a Refresh or Rebuild. Derived Assets may be transient in nature and perhaps only used for reporting purposes, so it may be more appropriate not to maintain History.

Note: This flag only affects history when the Derived Assets Refreshed or Rebuilt. It has no affect on History due to Network Editing.

In our example no History is being maintained.

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Administrator ***(Mandatory)*** ***(List)***

At the start and on completion of the Derived Asset DBMS job an e-mail will be sent to the User who is administratively responsible for the Derived Asset Type. These e-mails will notify the 'Administrator' that the job is Underway and then subsequently Completed. Any rejects results or errors will be detailed within the 'Completion' e-mail.

Note that for this reason the e-mail facility within the Exor System must be Setup and operational before any Derived Assets may be created. Refer to the General System Admin Guide for full details of Setting Up the e-mail facility.

Where Clause ***(Optional)***

A where clause may be specified so that only those rows from the merge results view (the _SVL one) which meet the criteria have assets created for them. For example:

MRG.TNC_ADMIN_UNIT IS NOT NULL

The fields used here are the same as in the attribute derivation.

Note: You do not include the word "WHERE"

In our example, there is no Where Clause in use.

Driving Network Types ***(Mandatory)*** ***List***

Derived Assets are essentially built from the results of a Merge Query. The Merge Query will be run against all Groups of the Type defined as a Driving Network Type. The list of these Network Types is the allowable parent Network Types for all Datum Types on which the Derived Asset Type is permitted to be located. This is defined using the 'Networks' Tab of the NM0410 – Asset Metamodel module (page 15).

In our example the Driving Network Type is 'Comp'.

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2.11.6 **Attribute Derivation Definition**

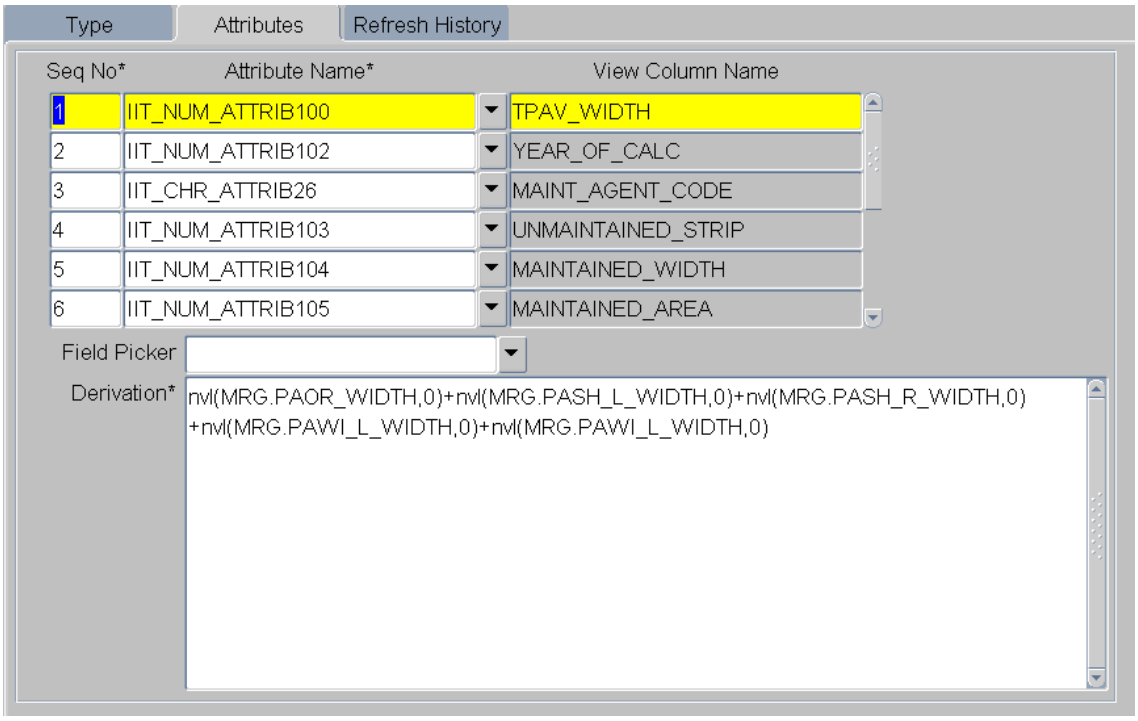

Figure 98 – Attribute Derivation Definition

The Derived Assets attribute values are based upon a set of Merge Results, but can include constant values, calculations based upon function calls or calculations involving other derived attribute values. The Attributes Tab is used to defined the source of the Derivation and 'map' it to the appropriate Derived Asset Attribute.

Seq No. ***(Mandatory)***

This is the sequence number of the Asset Attribute. It allows control over the order in which values are populated into the Asset record. This means that you can use one calculated attribute value as part of the calculation of another attribute's derivation (an example of this is shown for the Maintained Width Attribute later in our example.)

Attribute Name ***(Mandatory)*** ***(List)***

These are the Derived Asset Types Attributes. The List of Values shows those fields that are mandatory, both at the database level, *e.g.*, IIT_ADMIN_UNIT, and at the metadata level. Once selected the View Column Name defined for the attribute in the NM0410 – Asset Metamodel module will be displayed in the adjacent field.

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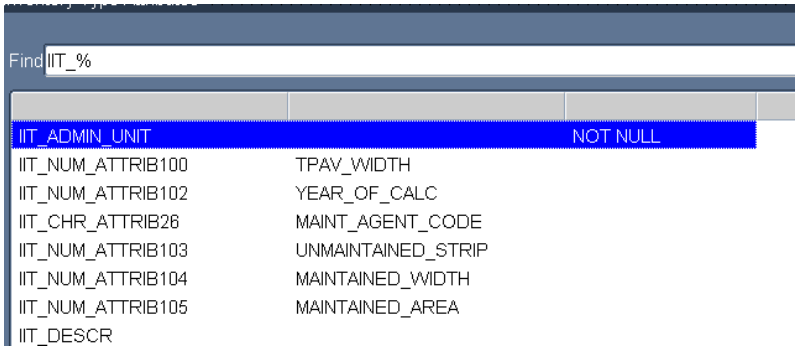

Figure 99 - Attributes

2.11.7 **Field Picker**

To assist in the creation of the derivation, a List of values has been added to allow the User to pick the required attribute. The List of Values gives a list of all fields that are available, both from the Merge Query View and the from actual Derived Asset itself. The fields available from the Merge Query view are prefixed with 'MRG' where as 'INV' is use for the Derived Asset fields.

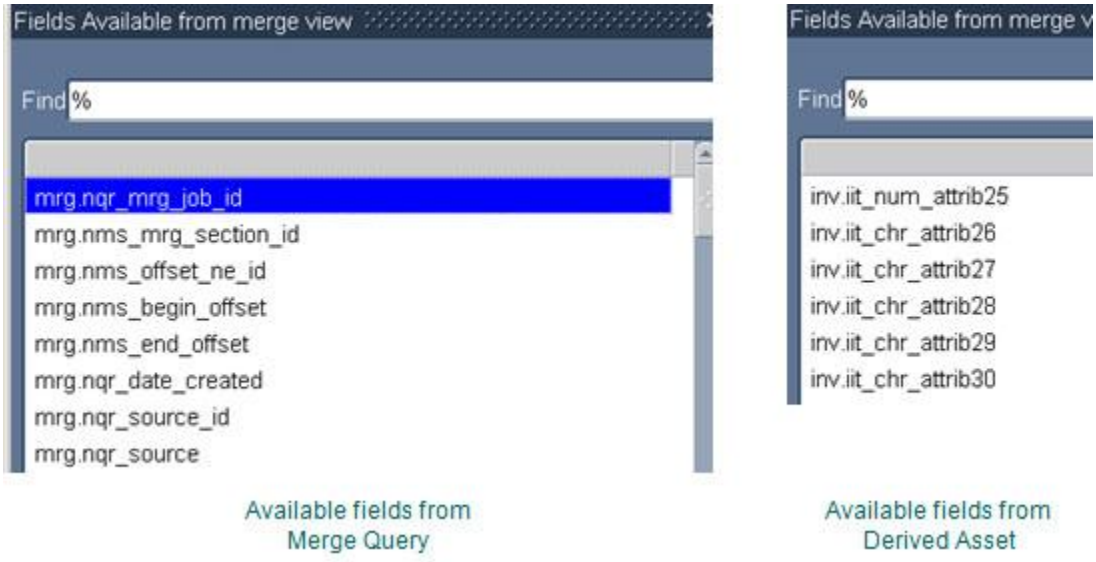

Figure 100 & Figure 101 – Available Fields

Figure 102 – Field Picker

Once the appropriate field has been selected using the Picker, the User can then COPY and PASTE the value into the 'derivation' field.

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Derivation (Mandatory)

The Derivation field is used to defined how the attribute value will be derived. It could be from a Merge Query results field, a constant value, a function call or involve other Derived Attribute values.

Note: Only PL/SQL functions can be used, so SQL only functions (such as DECODE) cannot be used.

Merge Results, but can include constant values, calculations based upon function calls or calculations involving other derived attribute values.

The Attribute from our example are used by way of explanation in the following tables.

Table 13

Seq 1	***Total Pavement Width***
Column Name	***View Column Name***
IIT_NUM_ATTRIB100	TPAV_WIDTH
Derivation	
nvl(MRG.PAOR_WIDTH,0)+nvl(MRG.PASH_L_WIDTH,0)+nvl(MRG.PASH_R_WIDTH,0) +nvl(MRG.PAWI_L_WIDTH,0)+nvl(MRG.PAWI_L_WIDTH,0)	
Comments	
The Total Pavement width is being derived from the sum of the Width attribute of each of the base Asset Types derived within the Merge query. Note that each XSP within the Merge 'Chunk' is included within the drivation.	

Table 14

Seq 2	***Year of Calculation***
Column Name	***View Column Name***
IIT_NUM_ATTRIB102	YEAR_OF_CALC
Derivation	
to_number(TO_CHAR(SYSDATE-365,'YYYY'))	
Comments	
The Year value is being derived from the system date.	

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Table 15

Seq 3	***Maintaining Agent Code***
Column Name	***View Column Name***
IIT_CHR_ATTRIB26	MAINT_AGENT_CODE
Derivation	
'AB1'	
Comments	
The code for the Maintaining Agent attribute has been defined as a constant value of 'AB1'	

Table 16

Seq 4	***Unmaintained Strip Width***
Column Name	***View Column Name***
IIT_NUM_ATTRIB103	UNMAINTAINED_STRIP
Derivation	
5	
Comments	
The Unmaintained Strip Width has been defined as a constant numeric 5	

Table 17

Seq 5	***Maintained Width***
Column Name	***View Column Name***
IIT_NUM_ATTRIB104	MAINTAINED_WIDTH
Derivation	
INV.IIT_NUM_ATTRIB100-INV.IIT_NUM_ATTRIB103	
Comments	
The Maintained Width is being derived from the Overall Width (Seq1) Attribute minus the Unmaintained Strip Width Attribute. This is an example of an attribute value being derived from other derived attributes. In this case any Asset attributes used within the derivation must have a lower sequence number than the attribute value being calculated.	

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Table 18

Seq 6	***Maintained Area***
Column Name	***View Column Name***
IIT_NUM_ATTRIB105	MAINTAINED_AREA
Derivation	
((MRG.NMS_END_OFFSET-MRG.NMS_BEGIN_OFFSET)*inv.iit_num_attrib104)*1000	
Comments	
The Maintained Area is being calculated from the length of the Merge 'chunk' multiplied by the Maintained Width (Seq 5) attribute. The result is then being multiplied by 1000 to convert the result into square metres.	

Table 19

Seq 7	***Admin Unit***
Column Name	***View Column Name***
IIT_ADMIN_UNIT	
Derivation	
1	
Comments	
The Admin unit has been defined as a constant numeric 1. This is the NAU_ADMIN_UNIT value. Care should be taken to ensure that the Admin Unit is correct for the Admin Type associated with the Derived Asset Type.	

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Figure 103 shows an example of a 'Total Pavement Width' Derived Asset as per our example.

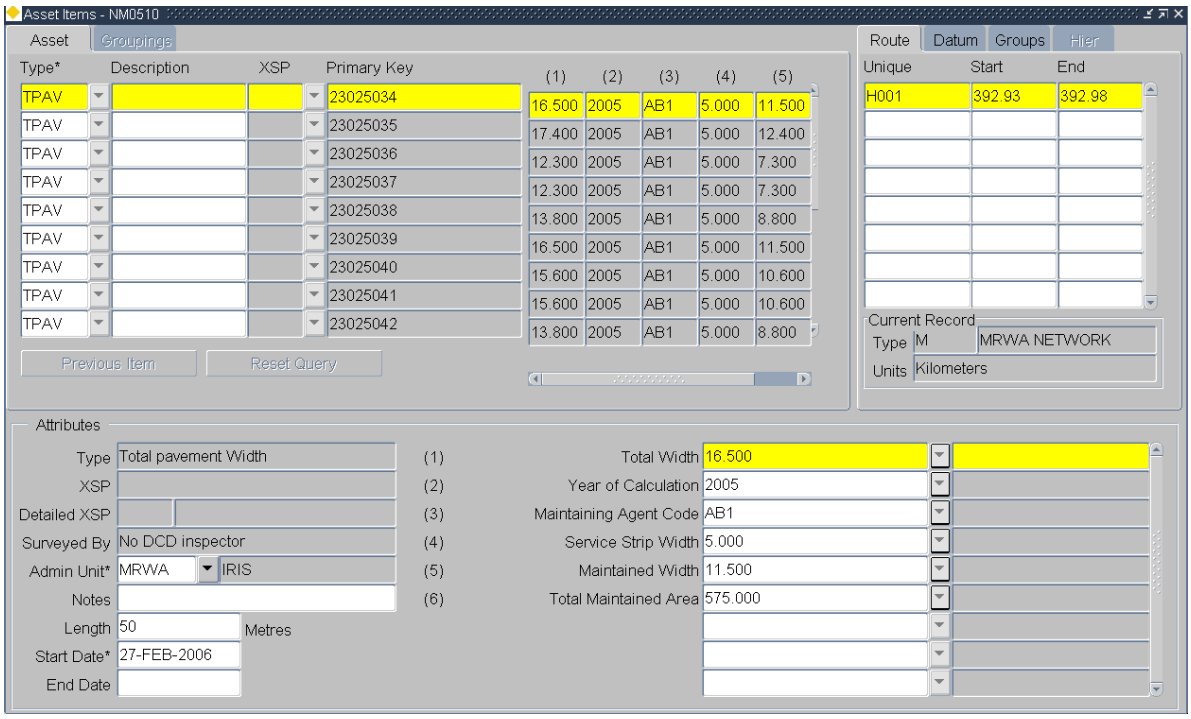

Figure 103

The next series of tables show more examples of Attribute Derivation to highlight other derivation methods not used within our Total Pavement Width example.

- Using a simple Merge Results Attribute

Table 20

Column Name	***Attribute Name***
IIT_NUM_ATTRIB104	COUNTY
Derivation	
mrg.RWFT_CNTY_FIPS	
Comments	
The County attribute is being derived directly from a Merge Results attribute	

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- Using a call to an Engineering Dynamic Segmentation Function

Table 21

Column Name	***Attribute Name***
IIT_NUM_ATTRIB105	Length Weighted Ave - AADT
Derivation	
round(NM3ENG_DYNSEG.GET_LENGTH_WEIGHTED_AVE(mrg.NQR_MRG_JOB_ID, mrg.NMS_MRG_SECTION_ID,'TSA','AADT'))	
Comments	
The Attribute Value is being derived using a function call to get the Length Weighted Average of an attribute called 'AADT' for an Asset Type of 'TSA'	

- Using a Case Statement

Table 22

Column Name	***Attribute Name***
IIT_CHR_ATTRIB42	Median Width
Derivation	
case when mrg.RWFT_HPMS_SAMP_SEG='Y' then NM3ENG_DYNSEG.GET_MOST_COMMON_VALUE(mrg.NQR_MRG_JOB_ID, mrg.NMS_MRG_SECTION_ID,'RWFT','MEDIAN_WIDTH') end	
Comments	
The Attribute Value is being derived using a CASE statement which will return the results of an Engineering Dynamic Segmentation function call if the merge attribute RWFT_HPMS_SAMP_SEG equates to 'Y' otherwise it will return a NULL value.	

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2.11.8 **Rebuilding / Refreshing Derived Assets**

The Initial build and all subsequent 'Rebuilds' and 'Refreshes' of Derived Assets (henceforth referred to as the 'Refresh' process) are carried out by running a DBMS Job. This Job must first be created by pressing the [Submit] button at the top of the Derived Asset Setup – NM0420 module (Figure 104).

Figure 104

This will create a DBMS which will subsequently create another DBMS which will either 'Refresh' or 'Rebuild' the Derived Assets at the specified Intervals.

The refresh process can be manually triggered by pressing the [Refresh Now] or [Rebuild Now] as required.

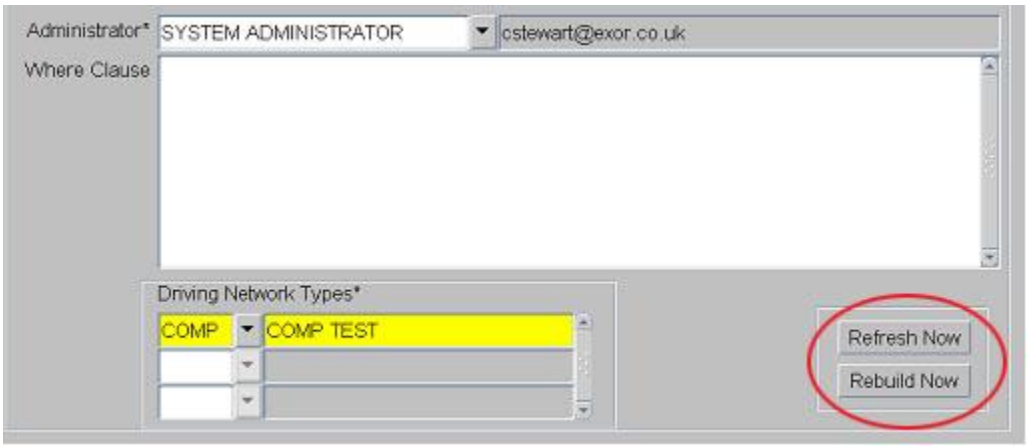

Figure 105

Note: The Systems Administrator may need to execute the 'Refresh / Rebuild' DBMS job manually depending on database settings.

The refresh process communicates with the Administrator by means of a series of e-mails. This requires that the e-mail component of Exor is configured correctly. The e-mails are sent as HTML e-mails with the styling applied from the HIG_ST_CSS product option. This is a static CSS (*i.e.*, not retrieved from the Database), which may be used in all e-mails sent from the system.

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2.11.9 In Progress e-mail

When the refresh process begins for each Derived Asset Type, an e-mail is sent out to inform the Administrator that it has started.

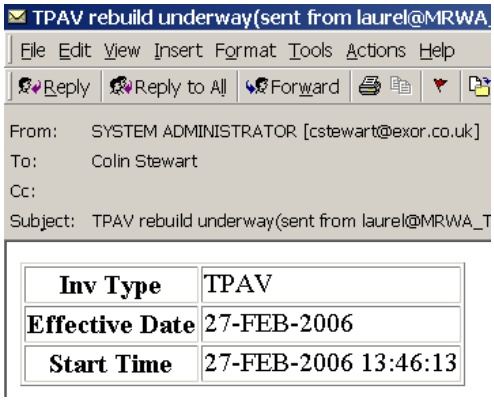
TPAV rebuild underway(sent from laurel@MRWA
File Edit View Insert Format Tools Actions Help
Reply Reply to All Forward
From: SYSTEM ADMINISTRATOR [cstewart@exor.co.uk]
To: Colin Stewart
Cc:
Subject: TPAV rebuild underway(sent from laurel@MRWA_T
Inv Type TPAV
Effective Date 27-FEB-2006
Start Time 27-FEB-2006 13:46:13

Figure 106

2.11.10 Completed e-mail

Upon completion of the refresh an e-mail is sent to the Administrator detailing the number of items created, and also the start and finish time.

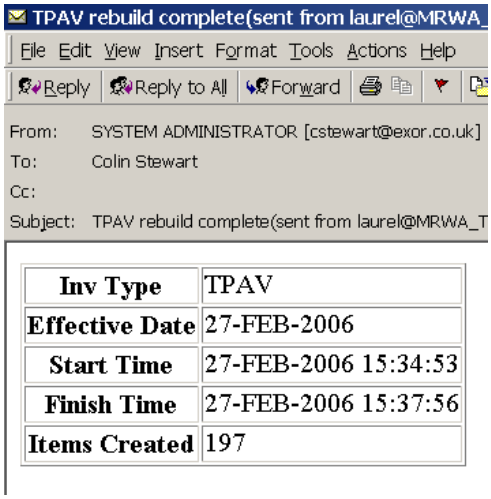
TPAV rebuild complete(sent from laurel@MRWA
File Edit View Insert Format Tools Actions Help
Reply Reply to All Forward
From: SYSTEM ADMINISTRATOR [cstewart@exor.co.uk]
To: Colin Stewart
Cc:
Subject: TPAV rebuild complete(sent from laurel@MRWA_T
Inv Type TPAV
Effective Date 27-FEB-2006
Start Time 27-FEB-2006 15:34:53
Finish Time 27-FEB-2006 15:37:56
Items Created 197

Figure 107

If any Assets fail to create (for instance because they violate the rules defined in the metamodel for that Derived Type) they will be detailed in the e-mail. The e-mail will also include an exception count. In the example shown in Figure 108, there has been a flexible attribute defined as mandatory, yet it is optional in the source data so approximately 25% of the total data has failed to be created.

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2.11.1 **Stop Errors**

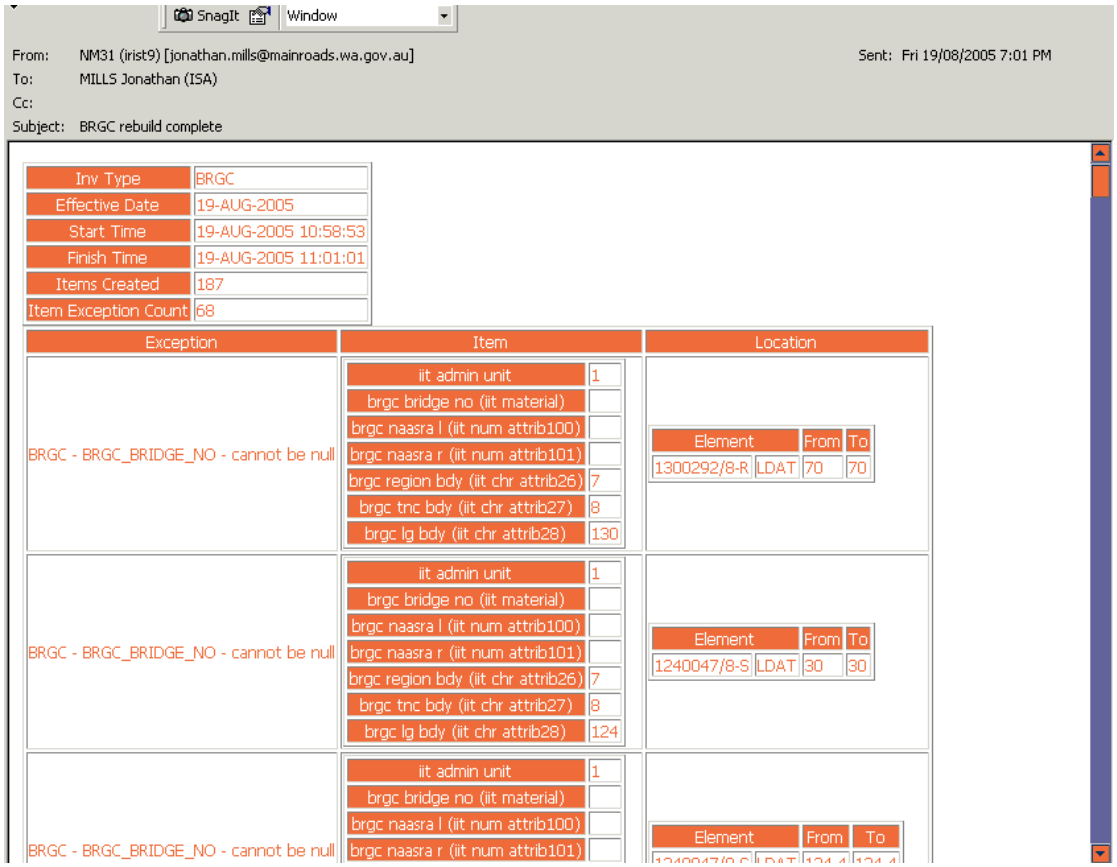
SnagIt
Window
From: NM31 (irist9) [jonathan.mills@mainroads.wa.gov.au]
Sent: Fri 19/08/2005 7:01 PM
To: MILLS Jonathan (ISA)
Cc:
Subject: BRGC rebuild complete
Inv Type BRGC
Effective Date 19-AUG-2005
Start Time 19-AUG-2005 10:58:53
Finish Time 19-AUG-2005 11:01:01
Items Created 187
Item Exception Count 68
Exception
Item
Location
BRGC - BRGC_BRIDGE_NO - cannot be null
iit admin unit 1
brgc bridge no (iit material)
brgc naasra l (iit num attrib100)
brgc naasra r (iit num attrib101)
brgc region bdy (iit chr attrib26) 7
brgc tnc bdy (iit chr attrib27) 8
brgc lg bdy (iit chr attrib28) 130
Element From To
1300292/8-R LDAT 70 70
BRGC - BRGC_BRIDGE_NO - cannot be null
iit admin unit 1
brgc bridge no (iit material)
brgc naasra l (iit num attrib100)
brgc naasra r (iit num attrib101)
brgc region bdy (iit chr attrib26) 7
brgc tnc bdy (iit chr attrib27) 8
brgc lg bdy (iit chr attrib28) 124
Element From To
1240047/8-S LDAT 30 30
BRGC - BRGC_BRIDGE_NO - cannot be null
iit admin unit 1
brgc bridge no (iit material)
brgc naasra l (iit num attrib100)
brgc naasra r (iit num attrib101)
Element From To

Figure 108

If the refresh process encounters a stop error then an email is sent to the administrator with details of that exception.

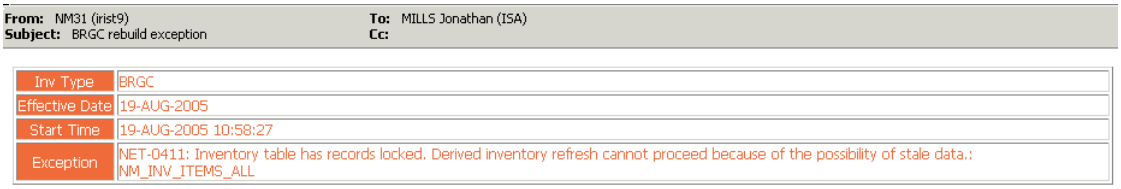
From: NM31 (irist9)
To: MILLS Jonathan (ISA)
Subject: BRGC rebuild exception
Cc:
Inv Type BRGC
Effective Date 19-AUG-2005
Start Time 19-AUG-2005 10:58:27
Exception NET-0411: Inventory table has records locked. Derived inventory refresh cannot proceed because of the possibility of stale data.: NM_INV_ITEMS_ALL

Figure 109

Examples of stop errors include:

- Outstanding locks on NM_INV_ITEMS_ALL (see caveats for detail)
- Malformation of the merge query

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2.11.2 **Caveats**

The composite refresh data recognises that data has changed by virtue of the fact that IIT_DATE_MODIFIED has a value that is greater than the last time a refresh was performed. Because of this the following restrictions are in place.

- Changes to foreign table inventory are only picked up on a rebuild, not on a refresh. Any FT inventory which exists in the same extent as some "real" inventory which is included in the composite type will of course have it's current value picked up at the time of the refresh
- Because we are using IIT_DATE_MODIFIED to determine change, a composite refresh is prevented from taking place if there are ANY outstanding locks on the NM_INV_ITEMS_ALL table. This effectively means that all composite refreshes must take place out of hours. The reasoning behind this is….
    1. At 11:00 a user modifies an asset ("FRED"), but does not commit the data. The IIT_DATE_MODIFIED field on that asset is set to 11:00, but because the data remains uncommitted no-one other than that user knows this
    2. At 11:30 the refresh job comes along and picks up all rows that have changed since it last ran (say at 09:00), but this will not find FRED as the change to that record remains uncommitted.
    3. At 11:45 the user commits the change to "FRED". The IIT_DATE_MODIFIED value is still 11:00
    4. At 14:00 the refresh job comes along and picks up all rows that have changed since it last ran (11:30), but this will not find FRED as FRED was changed at 11:00.

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2.12 Engineering Dynamic Segmentation Functions

Engineering Dynamic Segmentation Analysis is the ability to derive 'attribute' values such as Length Weighted Average, Maximum, Minimum, Mean or Median values for a specified Asset Attribute for homogenous zones or extents of Network created as a result of a Merge Query (Asset User Guide) or if using the Web Based Version of Engineering Dynamic Segmentation for a Group of Elements, Group of Groups, Network Extent or homogeneous zones or 'chunks' of Network created as a result of a Merge Query.

Engineering Dynamic Segmentation function calls may be included in the definition of a Merge Extract File using Merge Extract Definition – NM7055 (see Asset User Guide) or reported on directly using the Web Based Version of Engineering Dynamic Segmentation (see Asset User Guide).

The following Engineering Dynamic Segmentation Analysis functions are available:

- Mean Value
- Variance
- Biased Variance
- Standard Deviation
- Biased Standard Deviation
- Median Value
- Length Weighted Average
- First Value
- Last Value
- Minimum Value
- Maximum Value
- Most Common Value
- Most Common Value Details (Web Version Only)
- Most Frequent Value
- Most Frequent Value Details (Web Version Only)
- Sum
- Value Count (Merge Extract Only)
- Value Distributions (Web Version Only)

This section of the Asset Manager User Guide details each of the available functions, describing the formula used and necessary syntax for inclusion in the Merge File Extract Definition. For details on the Merge File Extract Definition – NM7055 or the Web Based Version of Engineering Dynamic Segmentation refer to the Asset User Guide.

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2.12.1 Mean (NM3ENG_DYNSEG.GET_MEAN_VALUE)

This function returns the Average (arithmetic mean) of the specified attribute values for each 'chunk' of network within the selected region of interest. The formula used is:

$$\text{Mean} = \frac{\sum(x)}{N}$$

Where X is the attribute values and N is the number of values in the range.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_MEAN_VALUE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 110 displays an example where the Mean roughness value is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

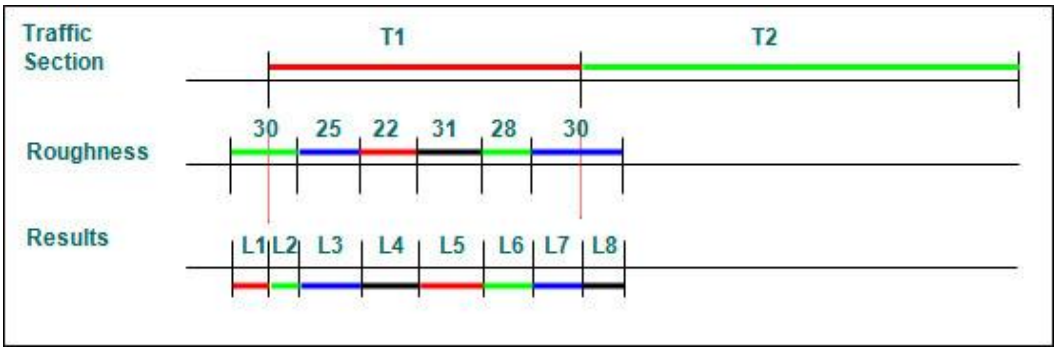

Figure 110

The Mean Roughness for the Zone represented by T1 would be calculated as follows:

$$\frac{(30+25+22+31+28+30)}{6} = 27.66$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 111

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2.12.2 **Variance (NM3ENG_DYNSEG.GET_VARIANCE)**

This function returns the Variance of the values of the specified attribute for each 'chunk' of network within the selected region of interest. The Variance is a measure of how spread out a distribution is. It is computed as the average squared deviation of each number from its Mean. The formula used is:

$$\textbf{Variance} = \frac{\sum(X - \mu)^2}{N}$$

Where X is the attribute value, μ is the Mean (see page 118) and N is the number of values in the range.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_VARIANCE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 112 displays an example where the Variance for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

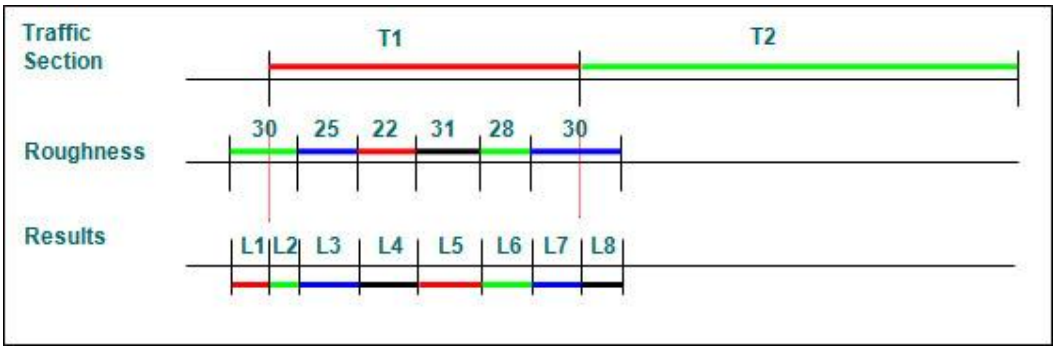

Figure 112

The Variance of the Roughness values for the Zone represented by T1 would be calculated as follows:

$$\frac{\sum((30–27.66)^2 + (25–27.66)^2 + (22–27.66)^2 + (31–27.66)^2 + (28–27.66)^2 + (30–27.66)^2)}{6} = 10.22$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 113

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2.12.3 **Biased Variance (NM3ENG_DYNSEG.GET_BIASED_VARIANCE)**

This function returns the Biased Variance of the values of the specified attribute for each 'chunk' of network within the selected region of interest. The Biased Variance is a measure of how spread out a distribution is. It is computed as the Biased Average squared deviation of each number from its Mean. The formula used is:

$$\text{Biased Variance} = \frac{\sum(X - \mu)^2}{N-1}$$

Where X is the attribute value, μ is the Mean (see page 118) and N is the number of values in the range.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_BIASED_VARIANCE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO', 'L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 114 displays an example where the Biased Variance for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

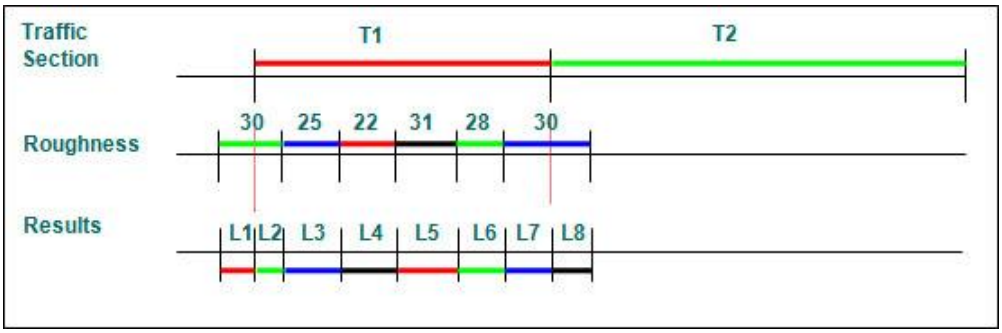

Figure 114

The Biased Variance of the Roughness values for the Zone represented by T1 would be calculated as follows:

$$\frac{\sum((30–27.66)^2 + (25–27.66)^2 + (22–27.66)^2 + (31–27.66)^2 + (28–27.66)^2 + (30–27.66)^2)}{(6-1)} = 12.66$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 115

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2.12.4 Standard Deviation (NM3ENG_DYNSEG.GET_STANDARD_DEVIATION)

This function returns the Standard Deviation of the values of the specified attribute for each 'chunk' of network within the selected region of interest. The Standard Deviation is a measure of how widely values are dispersed from the average value (the Mean (see page 118)) and is calculated as the square root of the Variance. The formula used is:

$$\text{Standard Deviation} = \sqrt{\frac{\sum(X - \mu)^2}{N}}$$

where μ is the Mean and N is the number of values in the range.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_STANDARD_DEVIATION
(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 116 displays an example where the Standard Deviation for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

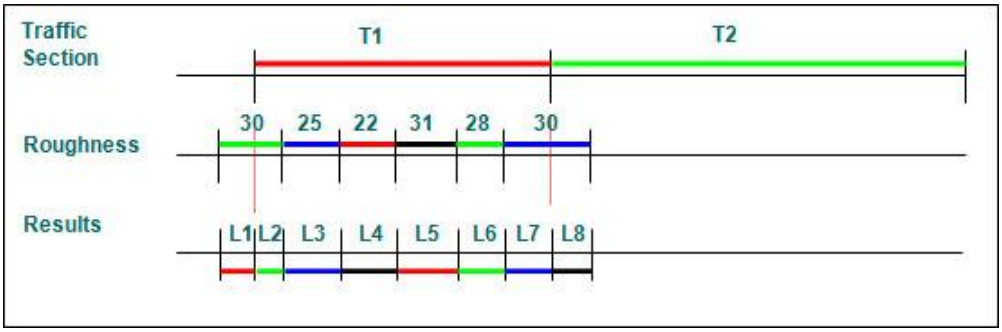

Figure 116

The Standard Deviation of the Roughness values for the Zone represented by T1 would be calculated as follows:

$$\frac{\sqrt{\sum((30-27.66)^2 + (25-27.66)^2 + (22-27.66)^2 + (31-27.66)^2 + (28-27.66)^2 + (30-27.66)^2)}}{6} = 3.19$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✘	Merge Extract Definition – NM7055	✓
Date	✘		

Figure 117

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2.12.5 Biased Standard Deviation (NM3ENG_DYNSEG.GET_BIASED_STANDARD_DEVIATION)

This function returns the Biased Standard Deviation of the values of the specified attribute for each 'chunk' of network within the selected region of interest. The Biased Standard Deviation is a measure of how widely values are dispersed from the average value (the Mean (see page 118)) and is calculated as the square root of the Biased Variance. The formula used is:

$$\text{Biased Standard Deviation} = \frac{\sqrt{\sum(X - \mu)^2}}{N-1}$$

where μ is the Mean and N is the number of values in the range.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_BIASED_STANDARD_DEVIATION(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 118 displays an example where the Biased Standard Deviation for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

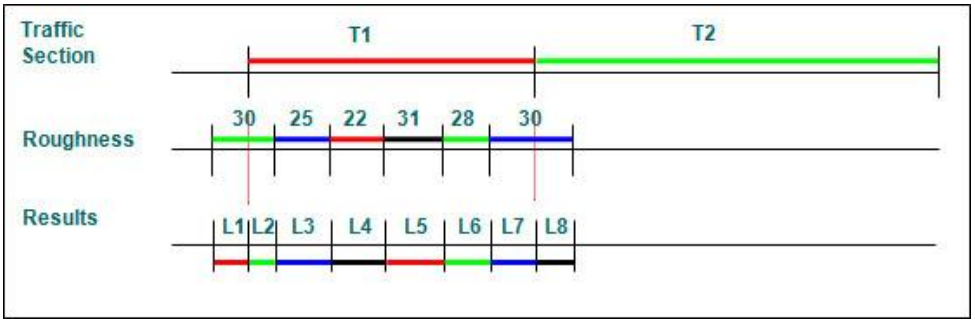

Figure 118

The Biased Standard Deviation of the Roughness values for the Zone represented by T1 would be calculated as follows:

$$\frac{\sqrt{\sum((30-27.66)^2 + (25-27.66)^2 + (22-27.66)^2 + (31-27.66)^2 + (28-27.66)^2 + (30-27.66)^2)}}{(6-1)} = 3.55$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 119

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2.12.6 **Median (NM3ENG_DYNSEG.GET_MEDIAN_VALUE)**

This function returns the Median value of the values of the specified attribute for each 'chunk' of network within the selected region of interest. The median is the number in the middle of a set of numbers; that is, half the numbers have values that are greater than the median, and half have values that are less. If there is an even number in the set, then the Median is calculated as the average of the two numbers in the middle.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_MEDIAN_VALUE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 120 displays an example where the Median value for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

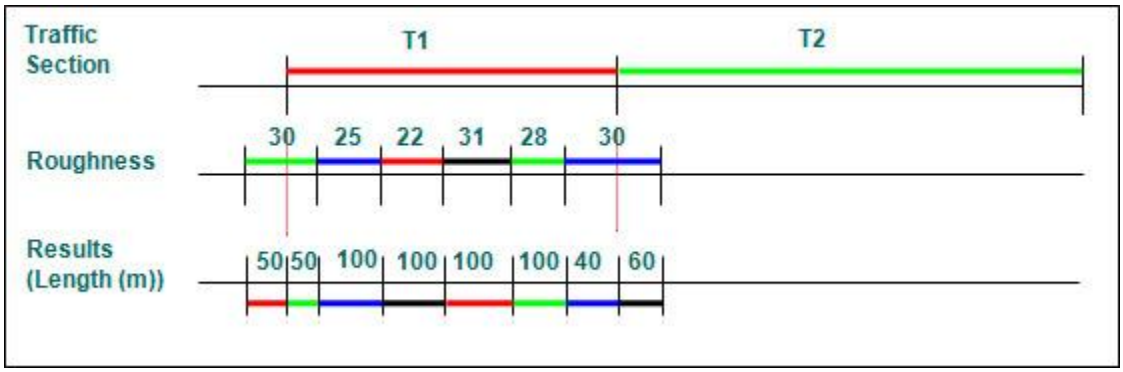

Figure 120

The Median value for Roughness values for the Zone represented by T1 would be 29.

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 121

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2.12.7 **Length Weighted Average (NM3ENG_DYNSEG.GET_LENGTH_WEIGHTED_AVE)**

This function returns the Length Weighted Average of the values of the values of the specified attribute for each 'chunk' of network within the selected region of interest. . The formula used is:

$$\mathbf{LWA} = \frac{\sum \mathbf{(L*X)}}{\sum \mathbf{L}}$$

Where L is the length over which the each attribute value, X exists within the selected region of interest.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_LENGTH_WEIGHTED_AVE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 122 displays an example where the Length Weighted Average for Roughness values is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Roughness values.

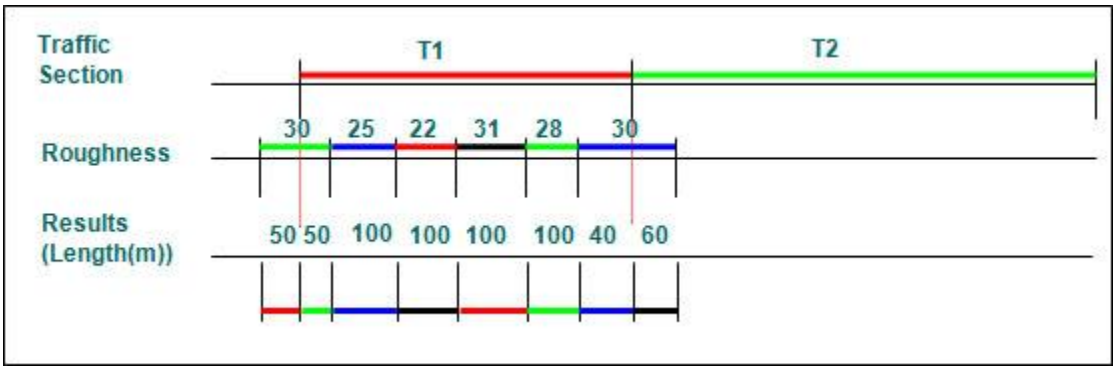

Figure 122

The Length Weighted Roughness Average for the Zone represented by T1 would be calculated as follows.

$$\frac{\mathbf{(50*30) + (100*25) + (100*22) + (100*31) + (100*28) + (40*30)}}{\mathbf{(50+100+100+100+100+40)}} = \mathbf{27.14}$$

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 123

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2.12.8 First Value (NM3ENG_DYNSEG.GET_FIRST_VALUE)

This function returns the FIRST value encountered of the specified attribute for each 'chunk' of network within the selected region of interest. In Figure 124 the First Value returned for the Traffic Section represented by T1 would be '30'.

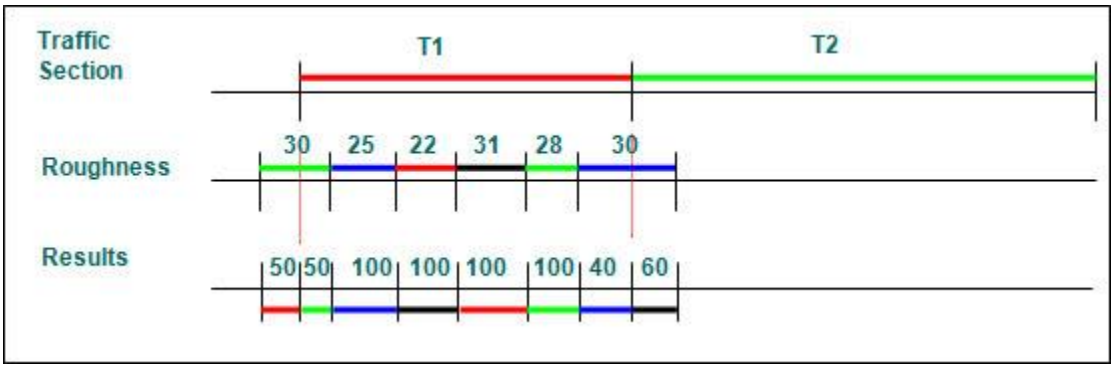

Figure 124

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_FIRST_VALUE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 125

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2.12.9 **Last Value (NM3ENG_DYNSEG.GET_LAST_VALUE)**

This function returns the LAST value encountered of the specified attribute for each 'chunk' of network within the selected region of interest. In Figure 126 the Last Value returned for the Traffic Section represented by T1 would be '30'.

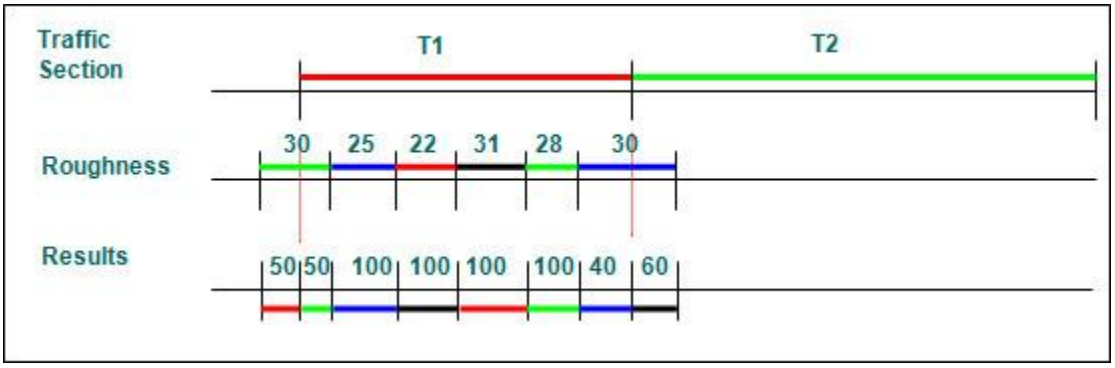

Figure 126

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_LAST_VALUE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 127

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2.12.10 **Minimum Value (NM3ENG_DYNSEG.GET_MINIMUM_VALUE)**

This function returns the Minimum Value for the selected Attribute for each 'chunk' of Network. In Figure 128 the Minimum Roughness value returned for the Traffic Section represented by T1 would be '22'.

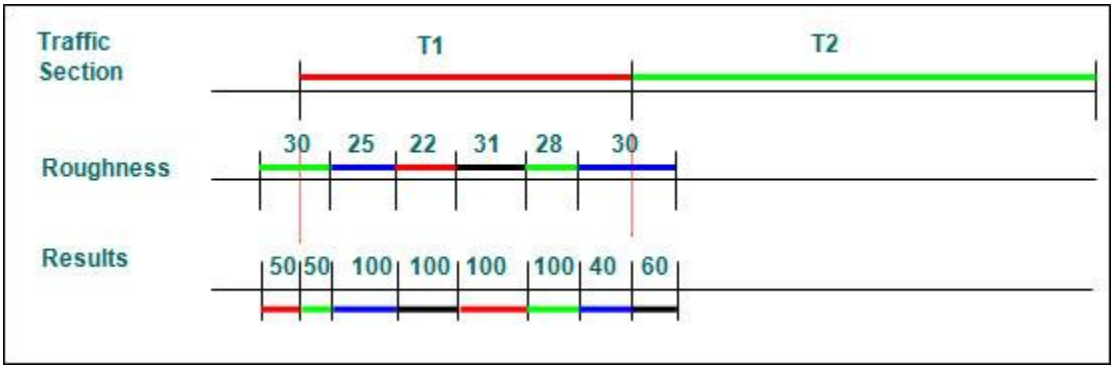

Figure 128

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_MINIMUM_VALUE(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'CORO','L','IIT_NAASRA_LANE').

Where 'CORO' is the required Asset Type, 'L' is the required XSP (optional) and 'IIT_NAASRA_LANE' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 129

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2.12.11 **Maximum Value (NM3ENG_DYNSEG.GET_MAXIMUM_VALUE)**

This function returns the Maximum Value for the selected Attribute for each 'chunk' of Network. In Figure 130 the Maximum Roughness value returned for the Traffic Section represented by T1 would be '31'.

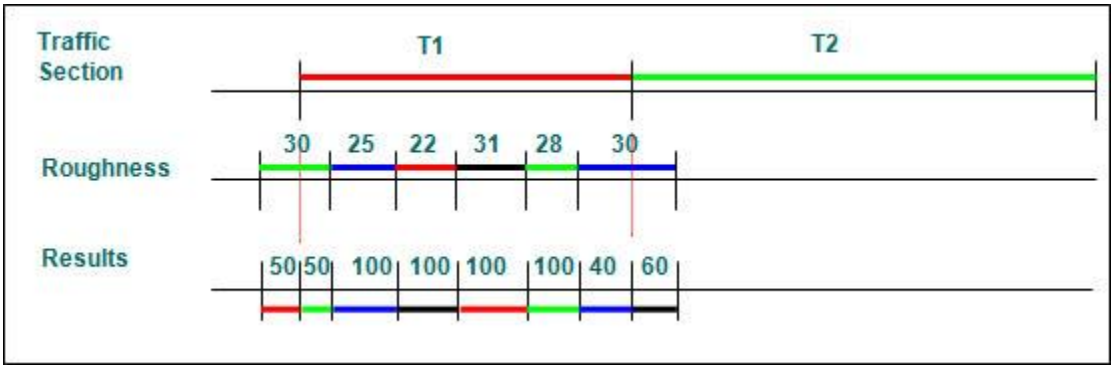

Figure 130

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗	Merge Extract Definition – NM7055	✓
Date	✗		

Figure 131

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2.12.12 Most Common Value (NM3ENG_DYNSEG.GET_MOST_COMMON_VALUE)

This function returns the Most Common value for the selected Attribute for each 'chunk' of Network, *i.e.*, the value that exists over the greatest extent of each 'chunk' within the range.

In Figure 132 the Most Common Roughness value returned for the Traffic Section represented by T1 would be '22' as it exists over an extent of 110m.

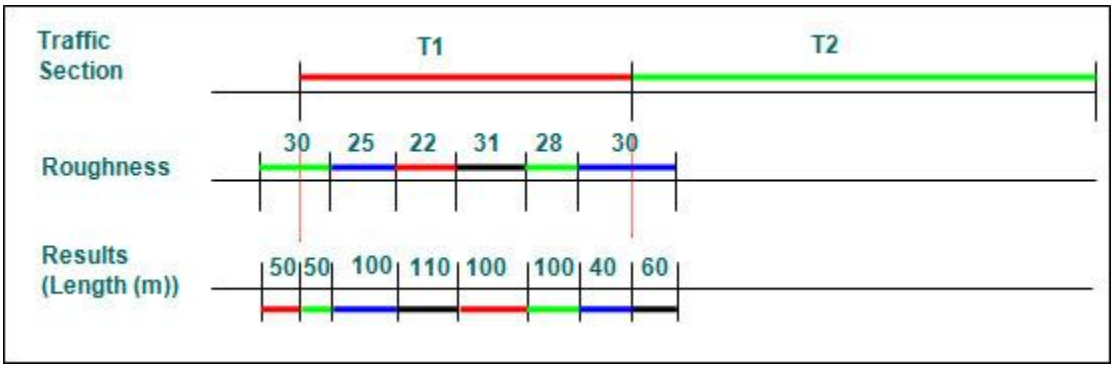

Figure 132

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✓	Merge Extract Definition – NM7055	✓
Date	✓		

Figure 133

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2.12.13 Most Common Value Dets (NM3ENG_DYNSEG.GET_MOST_COMMON_VALUE_DETS)

This function returns Details of the Most Common value for the selected Attribute for each 'chunk' of Network, *i.e.*, the value that exists over the greatest extent of each 'chunk' within the range. The following details are returned:

- The most common value
- The total Length over which the most common value exists
- The number of occurrences of the most common value
- The %age of the total length of the most common value within each 'chunk' of network.

For the example shown in Figure 132 these values would respectively be:

22

110

1

22%

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✓	Merge Extract Definition – NM7055	✗
Date	✓		

Figure 134

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2.12.14 Most Frequent Value (NM3ENG_DYNSEG.GET_MOST_FREQUENT_VALUE)

This function returns the value with the most occurances within each 'chunk' of network within the selected region of network.

In Figure 135 the Most Frequent Roughness value returned for the Traffic Section represented by T1 would be '30' as it occurs 2 times within the extent of the Traffic Section.

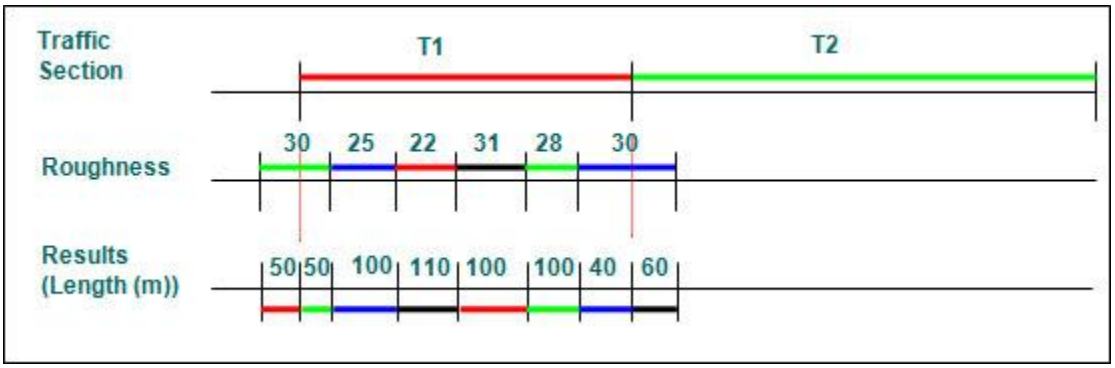

Figure 135

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✓	Merge Extract Definition – NM7055	✓
Date	✓		

Figure 136

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2.12.15 Most Frequent Value Dets (NM3ENG_DYNSEG.GET_MOST_FREQUENT_VALUE_DETS)

This function returns Details of the Most Frequent value for the selected Attribute for each 'chunk' of Network, *i.e.*, the value that exists over the greatest extent of each 'chunk' within the range. The following details are returned:

- The most frequent value
- The total Length over which the most frequent value exists
- The number of occurrences of the most frequent value
- The %age of the total length of the most frequent value within each 'chunk' of network.

For the example shown in Figure 135 these values would respectively be:

30

90

2

18%

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✓	Merge Extract Definition – NM7055	✗
Date	✓		

Figure 137

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2.12.16 **Sum (NM3ENG_DYNSEG.GET_SUM)**

This function returns the simple sum of the specified Attribute for each 'chunk' of Network within the selected Region of Interest.

The formula used is:

SUM = $\sum(x)$, where x is the attribute value.

Syntax (for use in Merge File Definition – NM7055)

NM3ENG_DYNSEG.GET_SUM(SEC.NQR_MRG_JOB_ID,SEC.NMS_MRG_SECTION_ID,'TC','L','TC_COUNT').

Where 'TC' is the required Asset Type, 'L' is the required XSP (optional) and 'TC_COUNT' is the View Column Name for the required Attribute (as defined in Asset Metamodel – NM0410).

Figure 138 displays an example where the Sum of the Total Traffic Counts is calculated for an Engineering Dynamic Segmentation analysis on Traffic Sections and Count values.

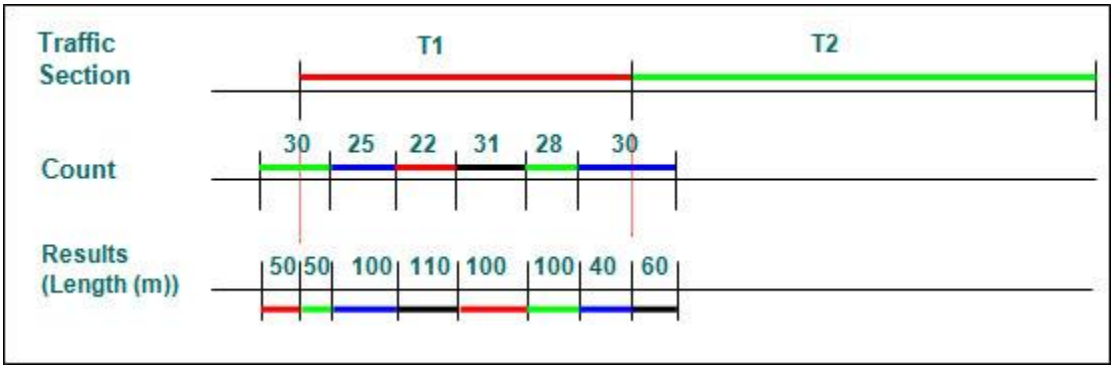

Figure 138

The Sum of the Count Values for the Zone represented by T1 would be calculated as follows.

30 + 25 + 22 + 31 + 28 + 30 = 166

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✗		
Date	✗	Merge Extract Definition – NM7055	✓

Figure 139

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2.12.17 Value Count (NM3ENG_DYNSEG.GET_VALUE_COUNT)

This function returns the number of occurrences of the selected Asset/Attribute and Value combination specified, for each 'chunk' of network within the selected region of network.

The example in Figure 140 would return a Value Count of 3 for the Traffic Section represented by 'T1' where the Asset / Attribute and Value combination was specified as PAOR / Base Material and 2 (Gravel) respectively.

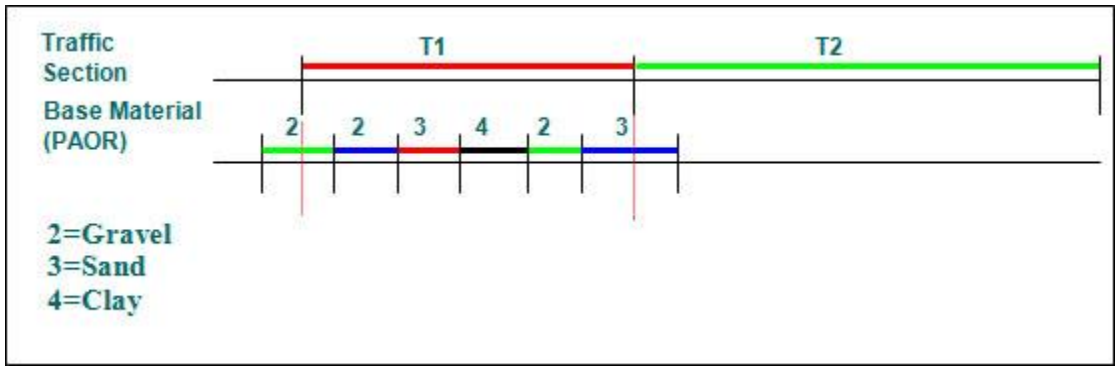

Figure 140

This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✗
Varchar	✓	Merge Extract Definition – NM7055	✓
Date	✓		

Figure 141

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2.12.18 Value Distributions (NM3ENG_DYNSEG.GET_VALUE_DISTRIBUTIONS)

This function returns a Distribution Array for the selected Asset/ Attribute combination for each 'chunk' of network within the selected region of network. The following details are displayed:

- Attribute Value
- The total length over which the Item with the Attribute Value exists
- The total number of occurrences of the Item/Attribute combination (*)
- The %age of the total length of the Item/Attribute value within each 'chunk' of network (*)

(*) An Asterisk will be displayed adjacent to the value with the highest Count and %age Length for each 'chunk' of network within the selected region of network when using the Web Version of Engineering Dynamic Segmentation.

The example in Figure 142 would return the values displayed in Table 23 for the Traffic Section represented by 'T1' where the Asset and Attribute combination was specified as PAOR and Base Material.

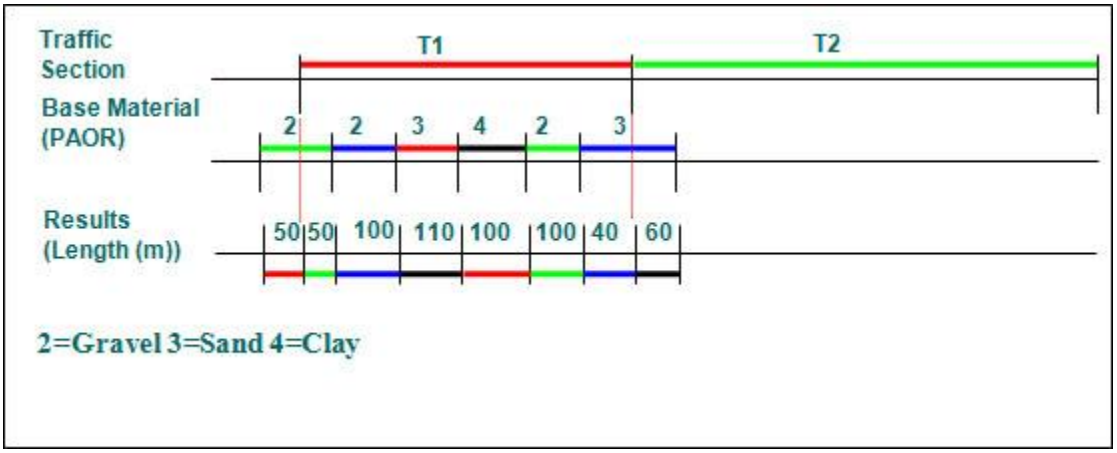

Figure 142

Table 23

Value	*Length*	*Count*		*% Total Length*	
2	250	3	*	50.00	*
3	150	2		30.00	
4	100	1		20.00	

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This function may be applied to attributes of the following Data Type		Function may be used in	
Number	✓	Web Version – NMWEB0020	✓
Varchar	✓	Merge Extract Definition – NM7055	✗
Date	✓		

Figure 143

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